YORK®

INSTALLATION, OPERATION, MAINT.

MILLENNIUM® AIR-COOLED SCROLL CHILLERS

YCA50 - YCA115
50 - 115 TON
175 - 400 kW
50Hz / 60Hz

IMPORTANT!
READ BEFORE PROCEEDING!
GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During installation,operation, maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: refrigerants, oils, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if mis-used or handled imporperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that this individual possesses independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

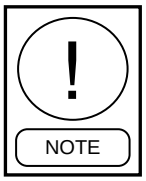
SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to areas of potential hazard:

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation.



NOTE is used to highlight additional information which may be helpful to you.

CHANGEABILITY OF THIS DOCUMENT

In complying with YORK's policy for continuous product improvement, the information contained in this document is subject to change without notice. While YORK makes no commitment to update or provide current information automatically to the manual owner, that information, if applicable, can be obtained by contacting the nearest YORK Engineering Systems Service office.

It is the responsibility of operating/service personnel to verify the applicability of these documents to the equipment in question. If there is any question in the mind of operating/service personnel as to the applicability of these documents, then prior to working on the equipment, they should verify with the owner whether the equipment has been modified and if current literature is available.

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REFRIGERANT FLOW DIAGRAM

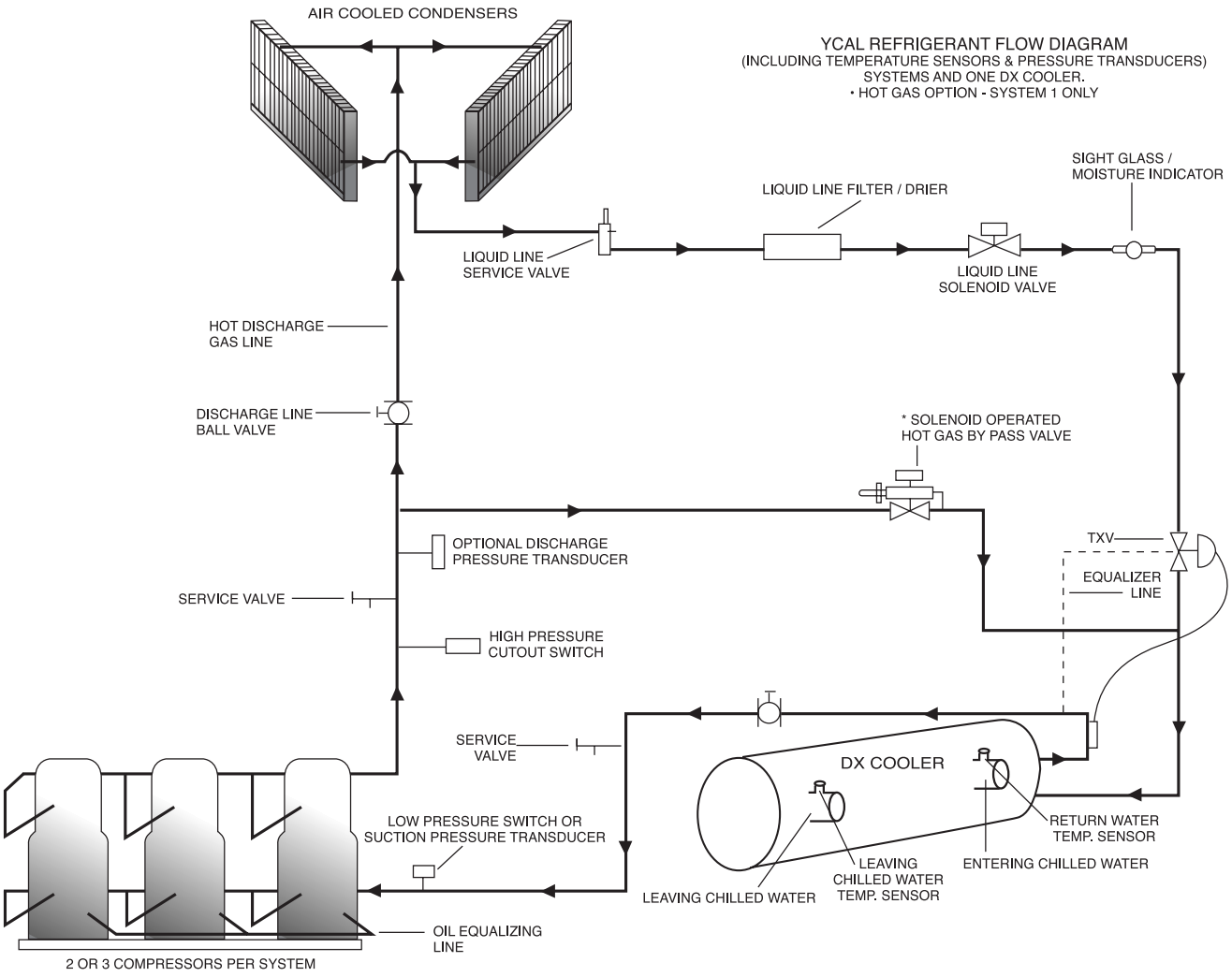

AIR COOLED CONDENSERS
YCAL REFRIGERANT FLOW DIAGRAM
(INCLUDING TEMPERATURE SENSORS & PRESSURE TRANSDUCERS)
SYSTEMS AND ONE DX COOLER.
• HOT GAS OPTION - SYSTEM 1 ONLY
SIGHT GLASS / MOISTURE INDICATOR
LIQUID LINE FILTER / DRIER
LIQUID LINE SERVICE VALVE
LIQUID LINE SOLENOID VALVE
HOT DISCHARGE GAS LINE
DISCHARGE LINE BALL VALVE
* SOLENOID OPERATED HOT GAS BY PASS VALVE
TXV
EQUALIZER LINE
OPTIONAL DISCHARGE PRESSURE TRANSDUCER
SERVICE VALVE
HIGH PRESSURE CUTOUT SWITCH
SERVICE VALVE
DX COOLER
RETURN WATER TEMP. SENSOR
LOW PRESSURE SWITCH OR SUCTION PRESSURE TRANSDUCER
LEAVING CHILLED WATER TEMP. SENSOR
ENTERING CHILLED WATER
LEAVING CHILLED WATER
OIL EQUALIZING LINE
2 OR 3 COMPRESSORS PER SYSTEM

FIG. 1 - REFRIGERANT FLOW DIAGRAM

INSTALLATION

WARNING

To ensure warranty coverage, this equipment must be commissioned and serviced by an authorized YORK service mechanic or qualified service person experienced in chiller installation. Installation must comply with all applicable codes, particularly in regard to electrical wiring and other safety elements such as relief valves, HP cut-out settings, design working pressures, and ventilation requirements consistent with the amount and type of refrigerant charge.

Lethal voltages exist within the control panels. Before servicing, open and tag all disconnect switches.

INSTALLATION CHECK LIST

The following items, 1 thru 5, must be checked before placing the units in operation.

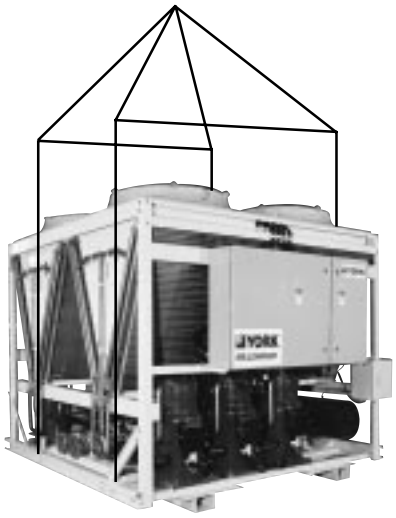
1. Inspect the unit for shipping damage.
2. Rig unit using spreader bars.
3. Open the unit only to install water piping system. Do not remove protective covers from water connections until piping is ready for attachment. Check water piping to ensure cleanliness.
4. Pipe unit using good piping practice (see ASHRAE handbook section 215 and 195).
5. Check to see that the unit is installed and operated within limitations (Refer to LIMITATIONS).

The following pages outline detailed procedures to be followed to install and start-up the chiller.

HANDLING

These units are shipped as completely assembled units containing full operating charge, and care should be taken to avoid damage due to rough handling.

The unit should be lifted by inserting hooks through the slot provided in unit base rails. Spreader bars should be used to avoid crushing the unit frame rails with the lifting chains. See below.



INSPECTION

Immediately upon receiving the unit, it should be inspected for possible damage which may have occurred during transit. If damag is evident, it should be noted in the carrier's freight bill. A written request for inspection by the carrier's agent should be made at once.

LOCATION AND CLEARANCES

These units are designed for outdoor installations on ground level, rooftop, or beside a building. Location should be selected for minimum sun exposure and ensure adequate supply of fresh air for the condenser. The units must be installed with sufficient clearances for air entrance to the condenser coil, for air discharge away from the condenser, and for servicing access.

Clearances are listed under "Notes" in the "DIMENSIONS" section.

FOUNDATION

The unit should be mounted on a flat and level foundation, floor, or rooftop capable of supporting the entire operating weight of the equipment. See PHYSICAL DATA for operating weight. If the unit is elevated beyond the normal reach of service personnel, a suitable catwalk must be capable of supporting service personnel, their equipment, and the compressors.

GROUND LEVEL LOCATIONS

It is important that the units be installed on a substantial base that will not settle. A one piece concrete slab with footers extended below the frost line is highly recommeded. Additionally, the slab should not be tied to the main building foundations as noise and vibration may be transmitted. Mounting holes are provided in the steel channel for bolting the unit to its foundation. (See DIMENSIONS.)

For ground level installations, precautions should be taken to protect the unit from tampering by or injury to unauthorized persons. Screws and/or latches on access panels will prevent casual tampering. However, further safety precautions such as a fenced-in enclosure or locking devices on the panels may be advisable.

ROOFTOP LOCATIONS

Choose a spot with adequate structural strength to safely support the entire weight of the unit and service personnel. Care must be taken not to damage the roof.

Consult the building contractor or architect if the roof is bonded. Roof installations should have wooden beams (treated to reduce deterioration), cork, rubber, or vibration isolators under the base to minimize vibration.

NOISE SENSITIVE LOCATIONS

Efforts should be made to assure that the chiller is not located next to occupied spaces or noise sentative areas where chiller noise level would be a problem. Chiller noise is a result of compressor and fan operation. Sound blankets for the compressors and low sound fans are available.

SPRING ISOLATORS (OPTIONAL)

When ordered, four (4) isolators will be furnished.

Identify the isolator, and locate at the proper mounting point, and adjust per instructions.

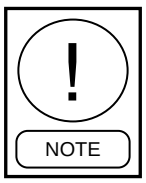
COMPRESSOR MOUNTING

The compressors are mounted on four (4) rubber isolators. The mounting bolts should not be loosened or adjusted at installation of the chiller.

CHILLED WATER PIPING

General - When the unit has been located in its final position, the unit water piping may be connected. Normal installation precautions should be observed in order to receive maximum operating efficiencies. Piping should be kept free of all foreign matter. All chilled water evaporator piping must comply in all respects with local plumbing codes and ordinances.

Since elbows, tees and valves decrease pump capacity, all piping should be kept as straight and as simple as possible. **All piping must be supported independent of the chiller**.



Consideration should be given to compressor access when laying out water piping. Routing the water piping too close to the unit could make compressor servicing/replacement difficult.

Hand stop valves should be installed in all lines to facilitate servicing.

Piping to the inlet and outlet connections of the chiller should include high-pressure rubber hose or piping loops to insure against transmission of water pump vibration. The necessary components must be obtained in the field.

Drain connections should be provided at all low points to permit complete drainage of the cooler and system water piping.

A small valve or valves should be installed at the highest point or points in the chilled water piping to allow any trapped air to be purged. Vent and drain connections should be extended beyond the insulation to make them accessible.

The piping to and from the cooler must be designed to suit the individual installation. It is important that the following considerations be observed:

1. The chilled liquid piping system should be laid out so that the circulating pump discharges directly into the cooler. The suction for this pump should be taken from the piping system return line and not the cooler. This piping scheme is recommended, but is not mandatory.

2. The inlet and outlet cooler connection sizes are 3", 4" or 6".

3. A strainer, preferably 40 mesh, **must** be installed in the cooler inlet line just ahead of the cooler. This is important to protect the cooler from entrance of large particles which could cause damage to the evaporator.

4. All chilled liquid piping should be throughly flushed to free it from foreign material before the system is placed into operation. Use care not to flush any foreign material into or through the cooler.

5. As an aid to servicing, thermometers and pressure gauges should be installed in the inlet and outlet water lines.

6. The chilled water lines that are exposed to outdoor ambients should be wrapped with supplemental heater cable and insulated to protect against freeze-up during low ambient periods, and to prevent formation of condensation on lines in warm humid locations.

7. A chilled water flow switch, (either by YORK or others) MUST be installed in the leaving water piping of the cooler. There should be a straight horizontal run of at least 5 diameters on each side of the switch. Adjust the flow switch paddle to the size of the pipe in which it is to be installed. (See manufacturer's instructions furnished with the switch.) The switch is to be wired to terminals 13-14 of CTB 1 located in the control panel, as shown on the unit wiring diagram.

The Flow Switch MUST NOT be used to start and stop the chiller (i.e. starting and stopping the chilled water pump). It is intended only as a safety switch.

WIRING

Liquid Chillers are shipped with all factory mounted controls wired for operation.

Field Wiring - Power wiring must be provided through a fused disconnect switch to the unit terminals (or optional molded disconnect switch) in accordance with N.E.C. or local code requirements.

A 120-1-60, 15 amp source must be supplied for the control panel through a fused disconnect when a control panel transformer (optional) is not provided.

See unit wiring diagrams for field and power wiring connections, chilled water pump starter contacts, alarm contacts, compressor run status contacts, PWM input, and load limit input. Refer to section on UNIT OPERATION for a detailed description of operation concerning aforementioned contacts and inputs.

EVAPORATOR PUMP START CONTACTS

Terminal block CTB2 - (refer wiring diagram) are normally open contacts that can be used to switch field supplied power to provide a start signal to the evaporator pump contactor. The contacts will be closed when any of the following conditions occur:

1. Low Leaving Chilled Liquid Fault.
2. Any compressor is running.
3. Daily schedule is not programmed OFF and the Unit Switch is ON.

The pump will not run if the micropanel has been powered up for less than 30 seconds, or if the pump has run in the last 30 seconds, to prevent pump motor overheating. Refer to unit wiring diagram.

SYSTEM RUN CONTACTS

Contacts are available to monitor system status. Normally-open auxiliary contacts from each compressor contactor are wired in parallel with CTB2 refer to unit wiring diagram.

ALARM STATUS CONTACTS

Normally-open contacts are avilable for each refrigerant system. These normally-open contacts close when the system if functional normally. The respective contacts will open when the unit is shut down on a unit fault, or locked out on a system fault. Field connections are at CTB2 terminals (refer wiring diagram) and terminals 31 to 32.

REMOTE START/STOP CONTACTS

To remotely start and stop the chiller, dry contacts can be wired in series with the flow switch and CTB1 - terminals 13 to 14. Refer to unit wiring diagram.

REMOTE EMERGENCY CUTOFF

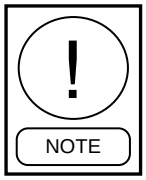
Immediate shutdown of the chiller can be accomplished by opening a field installed dry contact to break the electrical circuit between terminals to L on terminal block CTB2. The unit is shipped with a factory jumper installed between terminals to L, which must be removed if emergency shutdown contacts are installed.

PWM INPUT

The PWM input allows reset of the chilled liquid setpoint by supplying a “timed” contact closure. Field wiring should be connected to CTB1 - terminals 13 to 20. A detailed explanation is provided in the Unit Control section.

LOAD LIMIT INPUT

Load limiting is a feature that prevents the unit from loading beyond a desired value. The unit can be “load limited” either 33%, 50%, or 66%, depending on the number of compressors on unit. The field connections are wired to CTB1 - terminals 13 to 21, and work in conjunction with the PWM input. A detailed explanation is provided in the Unit Control section.

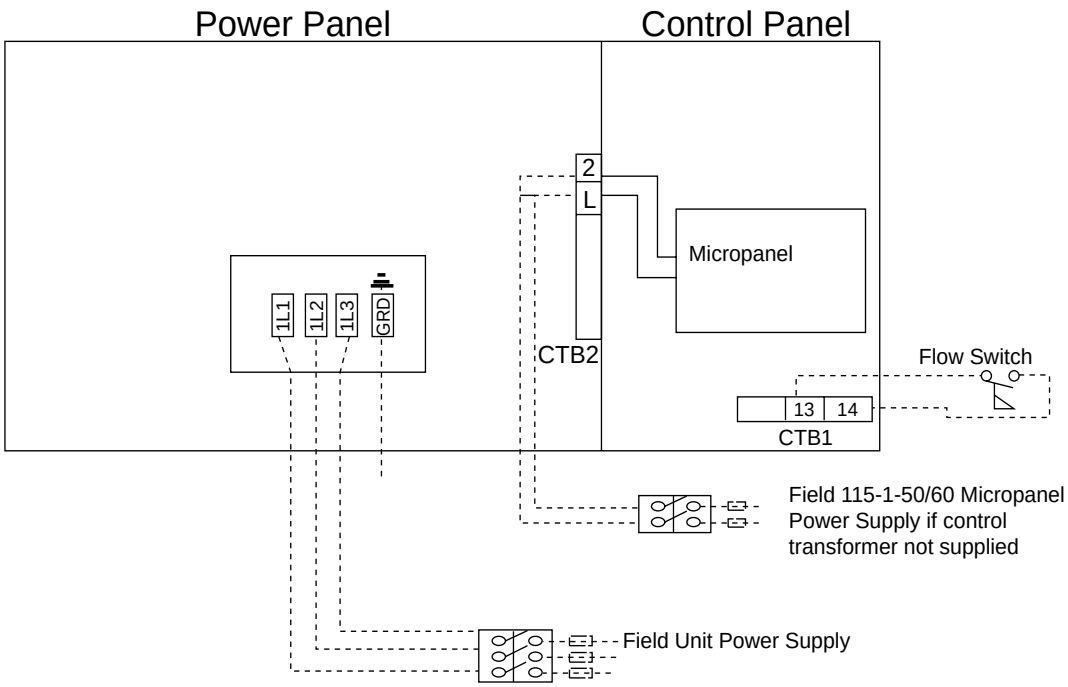


When using the Load Limit feature, the PWM feature will not function - SIMULTENEOUS OPERATION OF LOAD LIMITING AND TEMPERATURE RESET (PWM INPUT) CANNOT BE DONE.

FLOW SWITCH INPUT

The flow switch is field wired to CTB1 terminals 13 - 14. Refer to unit wiring diagram.

OPTIONAL SINGLE POINT POWER SUPPLY WIRING



WARNING

It is possible that multiple sources of power can be supplying the unit power panel. To prevent serious injury or death, the technician should verify that no lethal voltages are present inside the panel after disconnecting power, prior to working on equipment.

CAUTION

The unit evaporator heater uses 115 VAC. Disconnecting 115 VAC power from the unit, at or below freezing temperatures, can result in damage to the evaporator and unit as a result of the chilled liquid freezing.

DESIGN PARAMETER

YCA	Leaving water temp(°F)		Cooler Flow(GPM)		Air on condenser(°F)	
	MIN	MAX	MIN	MAX	MIN	MAX
50	40	50	70	168	0	105
60	40	50	90	217	0	105
70	40	50	104	253	0	105
80	40	50	121	279	0	105
95	40	50	146	336	0	105
115	40	50	182	419	0	105

Notes:
1 For leaving brine temp below 40°F(4.4°C), contact your nearest YORK office for application requirements.
2 For leaving water temp higher than 50°F(12.8°C), contact the nearest YORK office for application guidelines.
3 For operation at temp below 25°F(-3.9°C), the optional lowambient kit will need to be installed on the system.

VOLTAGE LIMITATIONS

The following volatge limitations are absolute and operation beyond these limitations may cause serious damage to the compressor.

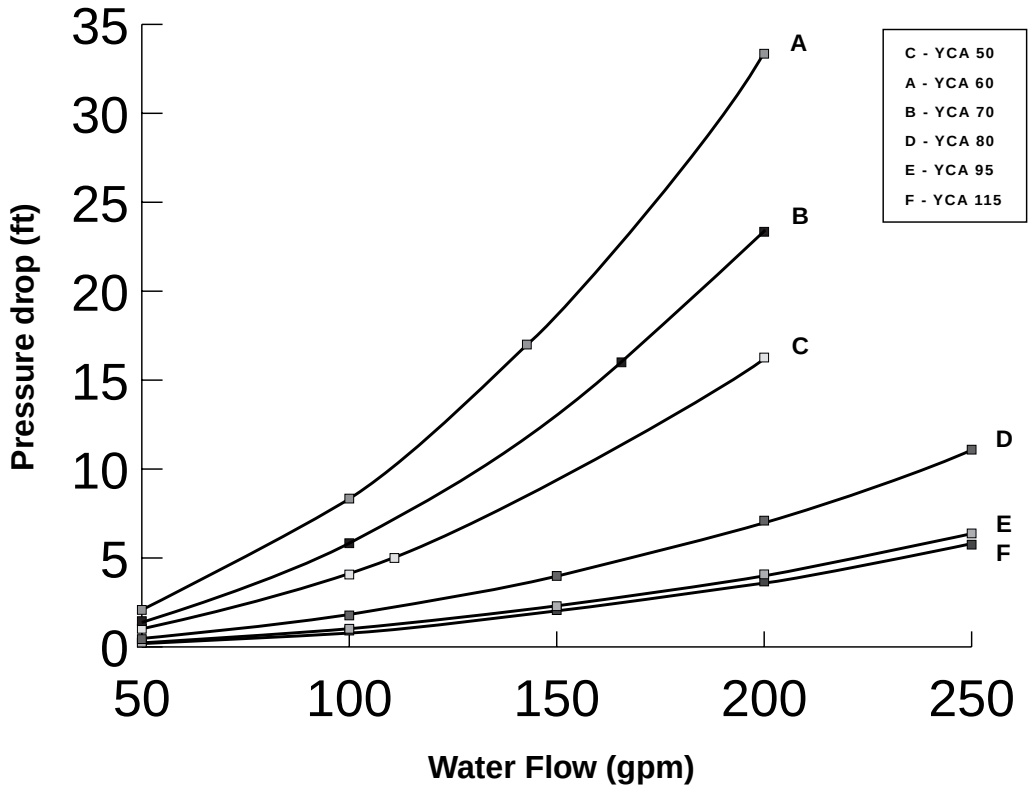
Excessive flow will cause damage to the cooler. Do not exceed max. cooler flow. Special care should be taken when multiple chillers are fed by a single pump.

TABLE 1 - VOLTAGES

UNIT POWER	MIN.	MAX.
230-3-60	207	253
380-3-50	355	415
460-3-60	414	506

Notes:
1. Standard units cannot be operated below 40°F leaving chilled water temperature.
2. For leaving water temperature higher than 55°F, contact the nearest YORK Office for application guidelines.
3. The evaporator is protected aganist freeze-up to -20.0°F with an electrical heater as standard.
4. Operation below 25°F requires Optional Low Ambient Kit for operation to 0°F.
5. Operation above 115°F requires Optional High Ambient Kit for operation to 125°F.

WATER FLOW (GPM) AGAINST PRESSURE DROP (FT)



PHYSICAL DATA

YCA Physical Data (R22, 50Hz)

Model	50	60	70	80	95	115
GENERAL						
Nominal Capacity (R22, RTons)	47.5	59.5	70	78.1	93.1	114.9
No. of Refrigerant Circuits	2	2	2	2	2	2
Compressors/Circuit	2	3	3	2	3	3
Compressors/Unit	4	6	6	4	6	6
Capacity Steps of Compressor (%)	100-75-50-25	100-83-67-50-33-17	100-83-67-50-33-17	100-75-50-25	100-83-67-50-33-17	100-83-67-50-33-17
COMPRESSOR						
Type	Scroll Compressor					
Designation	ZR19	ZR16	ZR19	ZR300	ZR250	ZR300
Compressor Hp/Each	15	13	15	25	20	25
Nominal Total Comp. Kw Input (R22)	51.9	64.9	77.3	85.2	101.6	125.4
RLA/Each (380V/3Ph/50Hz, R22)	23.6	17.1	23.6	35.7	29.3	35.7
Locked Rotor Amps/Each	198	167	198	250	218	250
Nominal Speed	2900 RPM					
Voltage Range	342 - 462V					
Power Supply	380-415V / 3Ph / 50Hz					
CONDENSER COIL						
Tube Diameter	3/8"					
Arrangement (Shape)	V	W				
Tube Height	42	44				45
Number of Rows	4	3	4	4	3	4
Fins Length	93"	81"	81"	81"	110"	110"
Fins Spacing (FPI)	14	12	12	14	12	14
CONDENSER FANS / MOTORS						
Type	Propeller Fan					
No. of Fans x Diameter	2 x 900mm	4 x 900mm			6 x 900mm	
Total Airflow (CFM)	32,600	52,000	49,500	54,400	74,000	75,600
Fan Motor Hp/Each	4	2	2	3	2	3
Fan Motor Poles / IP / Insul. Class	6 Poles, IP 55, Class F Insulation					
Power Supply	380-415V / 3Ph / 50Hz					
COOLER DIRECT EXPANSION						
Model	EHD205Rsx	EHD235RHsx	EHD275RHsx	EHD380Rsx	EHD360Hsx	EHD470Hsx
Water Pressure Drop (FT)	5	17	16	6	5	7
Water Connection Size	114.3mm(OD)	114.3mm(OD)	114.3mm(OD)	168.3mm(OD)	168.3mm(OD)	168.3mm(OD)
Max. Water Side Pressure (psig)	150					
Max. Ref. Side Pressure (psig)	300					
SHIPPING WEIGHT						
AL Fin Coils (Kg)	1568	2414	2640	2740	3130	3380
Cu Fin Coils (Kg)	2393	2687	2999	3099	3512	3762
OPERATING WEIGHT						
AL Fin Coils (Kg)	1645	2547	2780	2880	3316	3566
Cu Fin Coils (Kg)	2502	2821	3139	3239	3699	3949
Ref. Charge/Circuit (Kg)	16	17	23	24	30	36
DIMENSION						
Height (mm)	1770	2132			2132	
Width (mm)	2711	2290			3252	
Depth (mm)	1884	2516			2290	

Note:
1. Nominal info based on LWCT of 44°F and 95°F ambient temperature, Refrigerant R22, Power Supply 380-415V/3Ph/50Hz
2. All specifications are subjected to change without prior notice.

PHYSICAL DATA

YCA Physical Data (R22, 60Hz)

Model	50	60	70	80	95	115
GENERAL						
Nominal Capacity (R22, RTons)	47.5	58.1	69.0	77.2	89.2	113.5
No. of Refrigerant Circuits	2	2	2	2	2	2
Compressors/Circuit	2	2	3	2	2	3
Compressors/Unit	4	4	6	4	4	6
Capacity Steps of Compressor (%)	100-75-50-25	100-75-50-25	100-83-67-50-33-17	100-75-50-25	100-75-50-25	100-83-67-50-33-17
COMPRESSOR						
Type	Scroll Compressor					
Designation	ZR16	ZR19	ZR16	ZR250	ZR300	ZR250
Compressor Hp/Each	13	15	13	20	25	20
Nominal Total Comp. Kw Input (R22)	51.8	63.4	76.2	84.2	97.3	123.8
RLA/Each (380V/3Ph/50Hz, R22)	17.1	23.6	17.1	29.3	35.7	29.3
Locked Rotor Amps/Each	167	198	167	218	250	218
Nominal Speed	3500 RPM					
Voltage Range	415-506 V					
Power Supply	460V / 3Ph / 60Hz					
CONDENSER COIL						
Tube Diameter	3/8"					
Arrangement (Shape)	V	W				
Tube Height	42	44				45
Number of Rows	4	3	4	4	3	4
Fins Length	93"	81"	81"	81"	110"	110"
Fins Spacing (FPI)	14	12	12	14	12	14
CONDENSER FANS / MOTORS						
Type	Propeller Fan					
No. of Fans x Diameter	2 x 900mm	4 x 900mm			6 x 900mm	
Total Airflow (CFM)	32,600	52,000	49,500	54,400	74,000	75,600
Fan Motor Hp/Each	4	2	2	3	2	3
Fan Motor Poles / IP / Insul. Class	6 Poles, IP 55, Class F Insulation					
Power Supply	460V / 3Ph / 60Hz					
COOLER DIRECT EXPANSION						
Model	EHD205Rsx	EHD235RHsx	EHD275RHsx	EHD380Rsx	EHD360Hsx	EHD470Hsx
Water Pressure Drop (FT)	5	17	16	6	5	7
Water Connection Size	114.3mm(OD)	114.3mm(OD)	114.3mm(OD)	168.3mm(OD)	168.3mm(OD)	168.3mm(OD)
Max. Water Side Pressure (psig)	150					
Max. Ref. Side Pressure (psig)	300					
SHIPPING WEIGHT						
AL Fin Coils (Kg)	1538	2384	2610	2700	3090	3330
Cu Fin Coils (Kg)	2363	2667	2969	3059	3472	3712
OPERATING WEIGHT						
AL Fin Coils (Kg)	1645	2547	2780	2880	3316	3566
Cu Fin Coils (Kg)	2502	2821	3139	3239	3699	3949
Ref. Charge/Circuit (Kg)	16	17	23	24	30	36
DIMENSION						
Height (mm)	1770	2132			2132	
Width (mm)	2711	2290			3252	
Depth (mm)	1884	2516			2290	

Note:
1. Nominal info based on LWCT of 44°F and 95°F ambient temperature, Refrigerant R22, Power Supply 460V/3Ph/60Hz
2. All specifications are subjected to change without prior notice.

PHYSICAL DATA

YCA Physical Data (R407c, 50Hz)

Model	50	60	70	80	95	115
GENERAL						
Nominal Capacity (R22, RTons)	44.6	55.8	65.6	73.2	87.4	107.7
No. of Refrigerant Circuits	2	2	2	2	2	2
Compressors/Circuit	2	3	3	2	3	3
Compressors/Unit	4	6	6	4	6	6
Capacity Steps of Compressor (%)	100-75-50-25	100-83-67-50-33-17	100-83-67-50-33-17	100-75-50-25	100-83-67-50-33-17	100-83-67-50-33-17
COMPRESSOR						
Type	Scroll Compressor					
Designation	ZR19	ZR16	ZR19	ZR300	ZR250	ZR300
Compressor Hp/Each	15	13	15	25	20	25
Nominal Total Comp. Kw Input (R22)	52.9	66.2	77.9	86.9	103.6	127.8
RLA/Each (380V/3Ph/50Hz, R22)	24.5	20.7	24.5	36	31	36
Locked Rotor Amps/Each	198	167	198	250	218	250
Nominal Speed	2900 RPM					
Voltage Range	342 - 462V					
Power Supply	380-415V / 3Ph / 50Hz					
CONDENSER COIL						
Tube Diameter	3/8"					
Arrangement (Shape)	V	W				
Tube Height	42	44				45
Number of Rows	4	3	4	4	3	4
Fins Length	93"	81"	81"	81"	110"	110"
Fins Spacing (FPI)	14	12	12	14	12	14
CONDENSER FANS / MOTORS						
Type	Propeller Fan					
No. of Fans x Diameter	2 x 900mm	4 x 900mm			6 x 900mm	
Total Airflow (CFM)	32,600	52,000	49,500	54,400	74,000	75,600
Fan Motor Hp/Each	4	2	2	3	2	3
Fan Motor Poles / IP / Insul. Class	6 Poles, IP 55, Class F Insulation					
Power Supply	380-415V / 3Ph / 50Hz					
COOLER DIRECT EXPANSION						
Model	EHD205Rsx	EHD235RHsx	EHD275RHsx	EHD380Rsx	EHD360Hsx	EHD470Hsx
Water Pressure Drop (FT)	5	17	16	6	5	7
Water Connection Size	114.3mm(OD)	114.3mm(OD)	114.3mm(OD)	168.3mm(OD)	168.3mm(OD)	168.3mm(OD)
Max. Water Side Pressure (psig)	150					
Max. Ref. Side Pressure (psig)	300					
SHIPPING WEIGHT						
AL Fin Coils (Kg)	1568	2414	2640	2740	3130	3380
Cu Fin Coils (Kg)	2393	2687	2999	3099	3512	3762
OPERATING WEIGHT						
AL Fin Coils (Kg)	1645	2547	2780	2880	3316	3566
Cu Fin Coils (Kg)	2502	2821	3139	3239	3699	3949
Ref. Charge/Circuit (Kg)	16	17	23	24	30	36
DIMENSION						
Height (mm)	1770	2132			2132	
Width (mm)	2711	2290			3252	
Depth (mm)	1884	2516			2290	

Note:
1. Nominal info based on LWCT of 44°F and 95°F ambient temperature, Refrigerant R407c, Power Supply 380-415V/3Ph/50Hz
2. All specifications are subjected to change without prior notice.

PHYSICAL DATA

YCA Physical Data (R407c, 60Hz)

Model	50	60	70	80	95	115
GENERAL						
Nominal Capacity (R22, RTons)	44.6	54.5	64.7	72.3	83.7	106.4
No. of Refrigerant Circuits	2	2	2	2	2	2
Compressors/Circuit	2	2	3	2	2	3
Compressors/Unit	4	4	6	4	4	6
Capacity Steps of Compressor (%)	100-75-50-25	100-75-50-25	100-83-67-50-33-17	100-75-50-25	100-75-50-25	100-83-67-50-33-17
COMPRESSOR						
Type	Scroll Compressor					
Designation	ZR16	ZR19	ZR16	ZR250	ZR300	ZR250
Compressor Hp/Each	13	15	13	20	25	20
Nominal Total Comp. Kw Input (R22)	52.9	64.6	76.8	85.8	99.2	126.2
RLA/Each (380V/3Ph/50Hz, R22)	20.7	24.5	20.7	31	36	31
Locked Rotor Amps/Each	167	198	167	218	250	218
Nominal Speed	3500 RPM					
Voltage Range	415 - 506 V					
Power Supply	460V / 3Ph / 60Hz					
CONDENSER COIL						
Tube Diameter	3/8"					
Arrangement (Shape)	V	W				
Tube Height	42	44				45
Number of Rows	4	3	4	4	3	4
Fins Length	93"	81"	81"	81"	110"	110"
Fins Spacing (FPI)	14	12	12	14	12	14
CONDENSER FANS / MOTORS						
Type	Propeller Fan					
No. of Fans x Diameter	2 x 900mm	4 x 900mm			6 x 900mm	
Total Airflow (CFM)	32,600	52,000	49,500	54,400	74,000	75,600
Fan Motor Hp/Each	4	2	2	3	2	3
Fan Motor Poles / IP / Insul. Class	6 Poles, IP 55, Class F Insulation					
Power Supply	460V / 3Ph / 60Hz					
COOLER DIRECT EXPANSION						
Model	EHD205Rsx	EHD235RHsx	EHD275RHsx	EHD380Rsx	EHD360Hsx	EHD470Hsx
Water Pressure Drop (FT)	5	17	16	6	5	7
Water Connection Size	114.3mm(OD)	114.3mm(OD)	114.3mm(OD)	168.3mm(OD)	168.3mm(OD)	168.3mm(OD)
Max. Water Side Pressure (psig)	150					
Max. Ref. Side Pressure (psig)	300					
SHIPPING WEIGHT						
AL Fin Coils (Kg)	1538	2384	2610	2700	3090	3330
Cu Fin Coils (Kg)	2363	2667	2969	3059	3472	3712
OPERATING WEIGHT						
AL Fin Coils (Kg)	1645	2547	2780	2880	3316	3566
Cu Fin Coils (Kg)	2502	2821	3139	3239	3699	3949
Ref. Charge/Circuit (Kg)	16	17	23	24	30	36
DIMENSION						
Height (mm)	1770	2132			2132	
Width (mm)	2711	2290			3252	
Depth (mm)	1884	2516			2290	

Note:
1. Nominal info based on LWCT of 44°F and 95°F ambient temperature, Refrigerant R407c, Power Supply 460V/3Ph/60Hz
2. All specifications are subjected to change without prior notice.

PRE-START-UP CHECKLIST

JOB NAME: _____
SALES ORDER #: _____

LOCATION: _____

SOLD BY: _____

INSTALLING
CONTRACTOR: _____

START-UP
TECHNICIAN /
COMPANY: _____

START-UP DATE: _____

CHILLER MODEL #: _____
SERIAL #: _____

CHECKING THE SYSTEM PRIOR TO INITIAL START (No Power)

Unit Checks

❑ 1. Inspect the unit for shipping or installation damage.

❑ 2. Assure that all piping has been completed.

❑ 3. Visually check for refrigerant piping leaks.

❑ 4. Open discharge line ball valve, and liquid line valve for each system.

❑ 5. The compressor oil level should be maintained so that an oil level is visible in the sight glass. The oil level can only be tested when the compressor is running in stabilized conditions, guaranteeing that there is no liquid refrigerant in the lower shell of the compressor. In this case, the oil should be between 1/4 and 3/4 in the sight glass. At shutdown, the oil level can fall to the bottom limit of the oil sight glass.

❑ 6. Assure water pumps are on. Check and adjust water pump flow rate and pressure drop across the cooler (see LIMITATIONS). Verify flow switch operation.

Excessive flow may cause catastrophic damage to the evaporator.

❑ 7. Check the control panel to assure it is free of foreign material (wires, metal chips, etc.).

❑ 8. Visually inspect wiring (power and control). Wiring MUST meet N.E.C. and local codes.

❑ 9. Check tightness of power wiring inside the power panel on both sides of the motor contactors and overloads.

❑ 10. Check for proper size fuses in main and control circuits, and verify overload setting corresponds with RLA and FLA values in electrical tables.

❑ 11. Assure 115 VAC Control Power to CTB2 has 15 AMP minimum capacity.

❑ 12. Be certain all water temp sensors are inserted completely in their respective wells and are coated with heat conductive compound.

❑ 13. Assure that evaporator TXV bulbs are strapped onto the suction lines at 4 or 8 o'clock positions.

PANEL CHECKS (Power ON - Both Unit Switch OFF)

❑ 1. Apply 3-phase power and verify its value. Voltage imbalance should be no more than 2% of the average voltage.

❑ 2. Apply 115 VAC and verify its value on the terminal bolck in the Power Panel. Make the measurement between terminals 1 and 2 of CTB2. The voltage should be 115 VAC +/- 10%.

❑ 3. Program / verify the Cooling Setpoints, Program Setpoints, and unit Options. Record the values below (see sections on Setpoints and Unit keys for programming instruction).

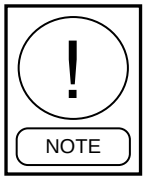
❑ 4. Put the unit into Service Mode (as described under the Control Service And Troubleshooting section) and cycle each condenser fan to ensure proper rotation.

❑ 5. Prior to this step, turn system 2 off. Connect a manifold gauge to system 1 suction and discharge service valves.

TABLE 2 - SETPOINTS

OPTIONS	
Display Language	
Sys 1 Switch	
Sys 2 Switch	
Unit Type	
Chilled Liquid	
Ambient Control	
Local/Remote Mode	
Control Mode	
Display Units	
Lead/Lag Control	
Fan Control	
Manual Override	
COOLING SETPOINTS	
Cooling Setpoint	
Range	
EMS-PWM Max. Setpoint	
PROGRAM	
Discharge Pressure Cutout	
Suct. Pressure Cutout	
Low Amb. Temp. Cutout	
Leaving Liquid Temp. Cutout	
Anti-Recycle Time	
Fan Control On-Pressure	
Fan Differential Off-Pressure	
Total # of Compressors	

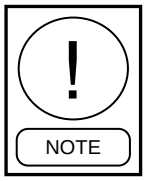
Place the Unit Switch in the control panel to the ON position. **As each compressor cycles on, ensure that the discharge pressure rises and the suction pressure decreases.** If this does not occur, the compressor being tested is operating in the reverse direction and must be corrected. After verifying proper compressor rotation, turn the Unit Switch to “OFF”.



The chilled liquid setpoint may need to be temporarily lowered to ensure all compressors cycle “on”.

This unit uses scroll compressors which can only operate in one direction. Failure to observe these steps could lead to compressor failure.

Place the Unit Switch in the control panel to the ON position. **As each compressor cycles “on”, ensure that the discharge pressure rises and the suction pressure decreases.** If this does not occur, the compressor being tested is operating in the reverse direction and must be corrected. After verifying proper compressor rotation, turn the Unit Switch to “OFF”.



The chilled liquid setpoint may need to be temporarily lowered to ensure all compressors cycle “on”.

❑ 6. After verifying compressor rotation, return the Unit Switch to the off position and ensure that both Systems are programmed for “ON”.

INITIAL START-UP

After the preceding checks have been completed and the control panel has been programmed as required in the pre-startup checklist, the chiller may be placed into operation.

❑ 1. Place the Unit Switch in the control panel to the ON position.

❑ 2. The first compressor will start and a flow of refrigerant will be noted in the sight glass. After several minutes of operation, the vapor in the sight glass will clear and there should be a solid column of liquid when the TXV stabilizes.

❑ 3. Allow the compressor to run a short time, being ready to stop it immediately if any unusual noise or adverse conditions develop.

❑ 4. Check the system operating parameters. Do this by selecting various displays such as pressures and temperatures and comparing these readings to pressures and temperatures taken with manifold gauges and temperature sensors.

❑ 5. With an ammeter, verify that each phase of the condenser fans and compressors are within the RLA as listed under Electrical Data.

CHECKING SUPERHEAT AND SUBCOOLING

The subcooling and superheat should always be checked when charging the system with refrigerant.

When the refrigerant charge is correct, there will be no vapor in the liquid sight glass with the system operating under full load conditions, and there will be 15°F (8.34°C) subcooled liquid leaving the condenser.

An overcharged system should be guarded against. The temperature of the liquid refrigerant out of the condenser should be no more than 15°F (8.34°C) subcooled at design conditions.

The subcooling temperature of each system can be calculated by recording the temperature of the liquid line at the outlet of the condenser and subtracting if from the liquid line suturation temperature at the liquid stop valve (liquid line saturation temp. is converted from a temperature/pressure chart).

Example:

Liquid Line Pressure = 202 PSIG converted to	102°F
minus Liquid Line Temp.	-87°F
SUBCOOLING =	15°F

The subcooling should be adjusted to 15°F at design conditions.

❑ 1. Record the liquid line pressure and its corresponding temperature, liquid line temperature and subcooling below:

	SYS 1	SYS 2	
Liq Line Press =	_____	_____	PSIG
Saturated Temp =	_____	_____	°F
Liq Line Temp =	_____	_____	°F
Subcooling =	_____	_____	°F

After the subcooling is verified, the suction superheat should be checked. The superheat should be checked only after steady state operation of the chiller has been established, the leaving water temperature has been pulled down to the required leaving water temperature, and the unit is running in a fully loaded condition. Correct superheat setting for a system is 10°F (5.56°C) 18” (46cm) from the cooler.

The superheat is calculated as the difference between the actual temperature of the returned refrigerant gas in the suction line entering the compressor and the temperature corresponding to the suction pressure as shown in a standard pressure/temperature chart.

Example:

Suction Temp =	46°F
minus Suction Press 60 PSIG converted to Temp	-34°F
Superheat =	12°F

When adjusted the expansion valve, the adjusting screw should be turned not more than one turn at a time, allowing sufficient time (approximately 15 minutes) between adjustments for the system and the thermal expansion valve to respond and stabilize.

Assure that superheat is set at 10°F (5.56°C).

❑ 2. Record the suction temperature, suction pressure, suction saturation temperature, and superheat of each system below:

	SYS 1	SYS 2	
Suction Temp =	_____	_____	°F
Suction Pressure =	_____	_____	PSIG
Saturation Temp =	_____	_____	°F
Superheat =	_____	_____	°F

LEAK CHECKING

❑ 1. Leak check compressors, fittings, and piping to assure no leaks.

If the unit is functioning satisfactorily during the initial operating period, no safeties trip and the compressors cycle to control water temperature to setpoint, the chiller is ready to be placed into operation.

UNIT OPERATING SEQUENCE

The operating sequence described below relates to operation on a hot water start after power has been applied, such as start-up commissioning. When a compressor starts, internal timers limit the minimum time before another compressor can start to 1 minute.

1. For the chiller system to run, the Flow Switch must be closed, any remote cycling contacts must be closed, the Daily Schedule must not be scheduling the chiller off, and temperature demand must be present.

2. When power is applied to the system, the microprocessor will start a 2 minute timer. This is the same timer that prevents an instantaneous start after a power failure.

3. At the end of the 2 minute timer, the microprocessor will check for cooling demand. If all conditions allow for start, the first compressor on the lead system will start and the liquid line solenoid will open. The compressor with the least run time in that system will be the first to start. Coincident with the start , the anticoincident timer will be set and begin counting downward from “60” seconds to “0” seconds.

   If the unit is programmed for Auto Lead/Lag, The system with the shortest average run-time of the compressors will be assigned as the “lead” system. A new lead/lag assignment is made whenever all systems shut down.

4. Several seconds after the compressor starts, that systems first condenser fan will be cycled on (outdoor air temperature > 25°F (-4°C). See the section on Operating Controls for details concerning condenser fan cycling.

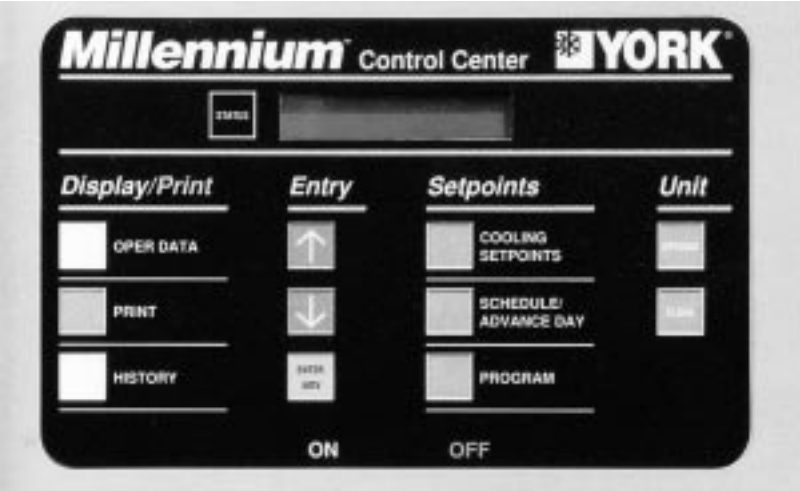
5. After 1 minutes of compressor run time, the next compressor in sequence will start when a system has to load. This compressor will be the one with the least run time that is currently not running in that system. Additional compressors will be started at 60 second intervals as needed to satisfy temperature setpoint.

6. If demand requiries, the lag system will cycle on with the same timing sequences as the lead system. Refer to the section on Capacity Control for a detailed explanation of system and compressor staging.

7. As the load decreases below setpoint, the compressors will be shut down in sequence. This will occur at intervals of either 60, 30, or 20 seconds based on water temperature as compared to setpoint, and control mode. See the section on Capacity Control for a detailed explanation.

8. When the last compressor in a “system” (two or three compressors per system), is to be cycled off, the system will initiate a pump-down. Each “system” has a pump-down feature upon shut-off. On a non-safety, non-unit switch shutdown, the LLSV will be turned off, and the last compressor will be allowed to run until the section pressure falls below the suction pressure cutout or for 180 seconds, which ever comes first.

UNIT CONTROLS
YORK MILLENNIUM CONTROL CENTER



INTRODUCTION

The YORK MicroComputer Control Center is a microprocessor based control system designed to provide the entire control for the liquid chiller. The control logic embedded in the microprocessor based control system will provide control for the chilled liquid temperatures, as well as sequencing, system safeties, display status, and daily schedules. The MicroComputer Control Center consists of four basic components, 1) microprocessor board, 2) transformer, 3) display and 4) keypad. The keypad allows programming and accessing setpoints, pressures, temperatures, cutouts, daily schedule, options, and fault information.

Remote cycling, demand limiting and chilled liquid temperature reset can be accomplished by field supplied contacts.

Compressor starting/stopping and loading/unloading decisions are performed by the Microprocessor to maintain leaving or return chilled liquid temperature. These decisions are a function of temperature deviation from setpoint.

A master ON/OFF switch is available to activate or deactivate the unit.

MICROPROCESSOR BOARD

The Microprocessor Board is the controller and decision maker in the control panel. System inputs such as pressure transducers and temperature sensors are connected directly to the Microprocessor Board. The Microprocessor Board circuitry multiplexes the analog inputs, digitizes them, and scans them to keep a constant watch on the chiller operating conditions. From this information, the Microprocessor then issues commands to the Relay Outputs to control contactors, solenoids, etc. for Chilled Liquid Temperature Control and to react to safety conditions.

Keypad commands are acted upon by the micro to change setpoints, cutouts, scheduling, operating requirements, and to provide displays.

The on-board power supply converts 24VAC from the 1T transformer to a +12 vdc and +5 vdc regulated supply located on the Microprocessor Board. This voltage is used to operate integrated circuitry on the board. The 40 character display and unit sensors are supplied power from the micro board 5vdc supply.

24VAC is rectified and filtered to provide unregulated +30 vdc to supply the flow switch.

PWM remote temperature reset, and demand limit circuitry which is available to be used with field supplied contacts.

The Microprocessor Board energizes on-board relays to output 115 VAC to motor contactors, solenoid valves, etc. to control system operation.

UNIT SWITCH

A UNIT ON/OFF switch is just underneath the keypad. This switch allows the operator to turn the entire unit OFF if desired. The switch must be placed in the ON position for the chiller to operate.

DISPLAY

The 40 Charater Display (2 lines of 20 characters) is a liquid crystal display used for displaying system parameters and operator messages.

The display in conjunction with the keypad, allows the operator to display system operating parameters as well as access programmed information already in memory. The display has a lighted background for night viewing and for viewing in direct sunlight.

When a key is pressed, such as the OPER DATA key, system parameters will be displayed and will remain on the display until another key is pressed. The system parameters can be scrolled with the use of the up and down arrow keys. The display will update all information at a rate of about 2 seconds.

Display Mesaages may show characters indicating “greater than” (>) or “less than” (<). These characters indicate the actual values are greater than or less than the limit values which are being displayed.

KEYPAD

The 12 button non-tactile keypad allows the user to retrieve vitals system parameters such as system pressures, temperatures, compressor running times and starts, option information on the chiller, and system setpoints. This data is useful for monitoring chiller operation, diagnosing potential problems, troubleshooting and commissioning the chiller.

If is essential the user become familiar with the use of the keypad and diaply. This will allow the user to make full use of the capabilities and diagnostic features available.

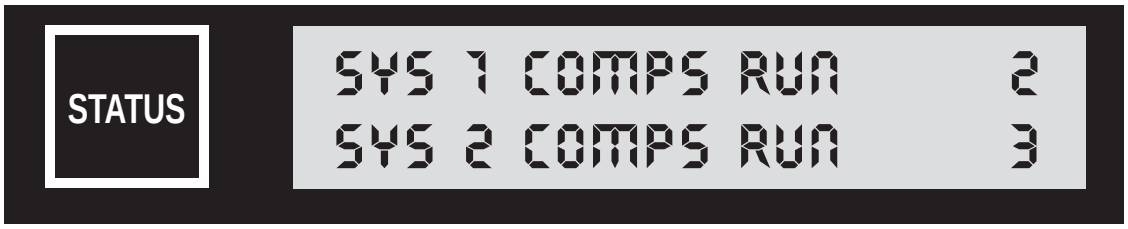
BATTERY BACK-UP

The Microprocessor Board contains a Real Time Clock integrated circuit chip with an internal battery back-up. The purpose of this baterry back-up is to assure any programmed values (setpoints, clock, cutouts, etc.) are mnot lost during a power failure regardless of the time involved in a power cut or shutdown period.

UNIT STATUS

Pressing the STATUS key will enable the operator to determine current chiller operating status. The messages displayed will include running status, cooling demand, fault status, external cycling device status, load limiting and anti-recycle/coincident timer status. The display will be a single message relating to the highest periority message as determined by the micro. Status messages fall into the categories of General Status and Fault Status.

“STATUS” KEY



The following messages are displayed when the “Status” key is pressed. Following each displayed message is an explanation pertaining to that particular display.

GENERAL STATUS MESSAGES

In the case of messages which apply to individual systems, SYS 1 and SYS 2 messages will both be displayed and may be different. In the case of single system units, all SYS 2 messages will be blank.

UNIT SWITCH OFF SHUTDOWN

This message informs the operator that the UNIT switch on the control panel is in the OFF position which will not allow the unit to run.

REMOTE CONTROLLED SHUTDOWN

The REMOTE CONTROLLED SHUTDOWN message indicates that either an ISN or BAS system has turned the unit off, not allowing it to run.

DAILY SCHEDULE SHUTDOWN

The DAILY SCHEDULE SHUTDOWN message indicates that the daily / holiday schedule programmed is keeping the unit from running.

FLOW SWITCH / REM STOP NO RUN PERMISSIVE

NO RUN PERM shows that either the flow switch is open or a remote start / stop contact is open in series with the flow switch.

SYS 1 SYS SWITCH OFF
SYS 2 SYS SWITCH OFF

Sys Switch Off tells that the system switch under OPTIONS is turned off. The system will not be allowed to run until the switch is turned back on.

SYS 1 NO COOL LOAD
SYS 2 NO COOL LOAD

These messages inform the operator that the chilled liquid temperature is below the point (determined by the setpoint and control range) that the micro will bring on a system or that the micro has not loaded the lead system far enough into the loading sequence to be ready to bring the lag system ON. The lag system will display this message until the loading sequence is ready for the lag system to start.

SYS 1 COMPS RUN X
SYS 2 COMPS RUN X

The COMPS RUNNING message indicates that the respective system is running due to demand. The "X" will be replaced with the number of compressors in that system that are running.

SYS 1 AR TIMER XX S
SYS 2 AR TIMER XX S

The anti-recycle timer message shows the amount of time left on the respective systems anti-recycle timer. This message is displayed when the system is unable to start due the anti-recycle timer being active.

SYS 1 AC TIMER XX S
SYS 2 AC TIMER XX S

The anti-coincident timer is a software feature that guards against 2 systems starting simultaneously. This assures instantaneous starting current does not become excessively high due to simultaneous starts. The micro limits the time between compressor starts to 1 minute regardless of demand or the anti-recycle timer being timed out. The anti-coincident timer is only present on two system units.

SYS 1 DSCH LIMITING
SYS 2 DSCH LIMITING

When this message appears, discharge pressure limiting is in effect. The Discharge Pressure Limiting feature is integral to the standard software control; however the discharge transducer is optional. Therefore, it is important to keep in mind that this control will not function unless the optional discharge transducer is installed in the system.

The limiting pressure is a factory set limit to keep the system from faulting on the high discharge pressure cutout due to high load or pull down conditions. When the unload point is reached, the micro will automatically unload the affected system by deenergizing one compressor. The discharge pressure unload will occur when the discharge pressure gets within 15 PSIG of the programmed discharge pressure cutout. This will only happen if the system is fully loaded and will shut only one compressor off. If the system is not fully loaded, discharge limiting will not go into effect. Reloading the affected system will occur when the discharge pressure drops to 85% of the unload pressure and 10 minutes have elapsed.

SYS 1 SUCT LIMITING
SYS 2 SUCT LIMITING

When this message appears, suction pressure limiting is in effect. Suction Pressure Limiting is only available on units that have the suction pressure transducer installed. If a low pressure switch is installed instead, suction pressure limiting will not function.

The suction pressure limit is a control point that limits the loading of a system when the suction pressure drops to within 15% above the suction pressure cutout. On a standard system programmed for 44 PSIG/3.0 Bar suction pressure cutout, the micro would inhibit loading of the affected system with the suction pressure less than or equal to 1.15* 44 PSIG/3.0 Bar = 50 PSIG/3.5 Ba. The system will be allowed to load after 60 seconds and after the suction pressure rises above the suction pressure limit point.

SYS 1 LOAD LIMIT XX%
SYS 2 LOAD LIMIT XX%

This message indicates that load limiting is in effect and the percentage of the limiting in effect. This limiting could be due to the load limit/pwm input or an ISN controller could be sending a load limit command.

MANUAL OVERRIDE

If MANUAL OVERRIDE mode is selected, the STATUS display will display this message. This will indicate that the Daily Schedule is being ignored and the chiller will start-up when chilled liquid temperature allows, Remote Contacts, UNIT switch and SYSTEM switches permitting. This is a priority message and cannot be overridden by anti-recycle messages, fault messages, etc. when in the STATUS display mode. Therefore, do not expect to see any other STATUS messages when in the MANUAL OVERRIDE mode. MANUAL OVERRIDE is to only be used in emergencies or for servicing. Manual override mode automatically disables it self after 30 minutes.

SYS 1 PUMPING DOWN
SYS 2 PUMPING DOWN

The PUMPING DOWN message indicates that a compressor in the respective system is presently in the process of pumping the system down. When pumpdown is initiated, the liquid line solenoid will close and a compressor will continue to run. When the suction pressure decreases to the suction pressure cutout setpoint, the compressor will cycle off. If pump down cannot be achieved three minutes after the liquid line solenoid closes, the compressor will cycle off.

FAULT STATUS MESSAGES

Safeties are divided into two categories - system safeties and unit safeties. System safeties are faults that cause the individual system to be shut down. Unit safeties are faults that cause all running compressors to be shut down. Following are display messages and explanations.

SYSTEM SAFETIES

System safeties are faults that cause individual systems to be shut down if a safety threshold is exceeded for 3 seconds. They are auto reset faults in that the system will be allowed to restart automatically after the fault condition is no longer present. However, if 3 faults on the same system occur within 90 minutes, that system will be locked out on the last fault. This condition is then a manual reset. The system switch (under OPTIONS key) must be turned off and then back on to clear the lockout fault.

SYS 1 HIGH DSCH PRES
SYS 2 HIGH DSCH PRES

The Discharge Pressure Cutout is a software cutout in the microprocessor and is backed-up by a mechanical high pressure cutout switch located in the refrigerant circuit. It assures that the system pressure does not exceed safe working limits. The system will shutdown when the programmable cutout is exceeded and will be allowed to restart when the discharge pressure falls below the cutout. *Discharge transducers must be installed for this function to operate.*

SYS 1 LOW SUCT PRESS
SYS 2 LOW SUCT PRESS

The Suction Pressure Cutout is a software cutout that protects the chiller from an evaporator freeze-up should the system attempt to run with a low refrigerant charge or a restriction in the refrigerant circuit.

At system start, the cutout is set to 10% of programmed value. During the next 3 minutes the cutout point is ramped up to the programmed cutout point. If at any time during this 3 minutes the suction pressure falls below the ramped cutout point, the system will stop. *This cutout is ignored for the first 90 seconds of system run time to avoid nuisance shutdowns, especially on units that utilize a low pressure switch in place of the suction pressure transducer*.

After the first 3 minutes, if the suction pressure falls below the programmed cutout setting, a “transient protection routine” is activated. This sets the cutout at 10% of the programmed value and ramps up the cutout over the next 30 seconds. If at any time during this 30 seconds the suction pressure falls below the ramped cutout, the system will stop. This transient protection scheme only works if the suction pressure transducer is installed. When using the mechanical LP switch, the operating points of the LP switch are: opens at 23 psig +/-5 psig (1.59 barg +/-.34 barg), and closes at 35 psig +/-5 psig (2.62 barg +/-.34 barg).

SYS 1 MP / HPCO FAULT
SYS 2 MP / HPCO FAULT

The Motor Protector/Mechanical High Pressure Cutout protect the compressor motor from overheating or the system from experiencing dangerously high discharge pressure. This fault condition is present when CR1 (sys 1) or CR2 (sys 2) relays de-energize due to the HP switch or the motor protector opening. This causes the respective CR contacts to open causing 0 vdc to be read on the inputs to the microboard. The fault condition is cleared when a 30 vdc signal is restored to the input.
The internal motor protecto opens at 185°F - 248°F (85°C - 120°C) and auto resets. The mechanical HP switch opens at 405 psig +/- 10 psig (27.92 barg +/- .69 barg) and closes at 330 psig +/- 25 psig (22.75 barg +/- 1.72 barg).

UNIT SAFETIES

Unit safeties are faults that cause all running compressors to be shut down. Unit faults are auto reset faults in that the unit will be allowed to restart automatically after the fault condition is no longer present.

UNIT FAULT :
LOW AMBIENT TEMP

The Low Ambient Temp Cutout is a safety shutdown designed to protect the chiller from operating in a low ambient condition. If the outdoor ambient temperature falls below the programmable cutout, the chiller will shut down. Restart can occur when temperature rises 2°F above the cutoff.

UNIT FAULT :
LOW LIQUID TEMP

The Low Leaving Chilled liquid Temp Cutout protects the chilled form an evaporator freeze-up should the chilled liquid temperature drop below the freeze point. This situation could occur under low flow conditions or if the micro panel setpoint values are improperly programmed. Anytime the leaving chilled liquid temperature (water or glycol) drops below the cutout point, the chiller will shutdown. Restart can occur when chilled liquid temperature rises 2°F above the cutout.

UNIT FAULT :
115VAC UNDER VOLTAGE

The Under Voltage Safety assures that the system is not operated at voltages where malfunction of the microprocessor could result in system damage. When the 115VAC to the micropanel drops below a certain level, a unit fault is initiated to safely shut down the unit. Restart is allowed after the unit is fully powered again and the anti-recycle timers have finished counting down.

UNIT WARNING

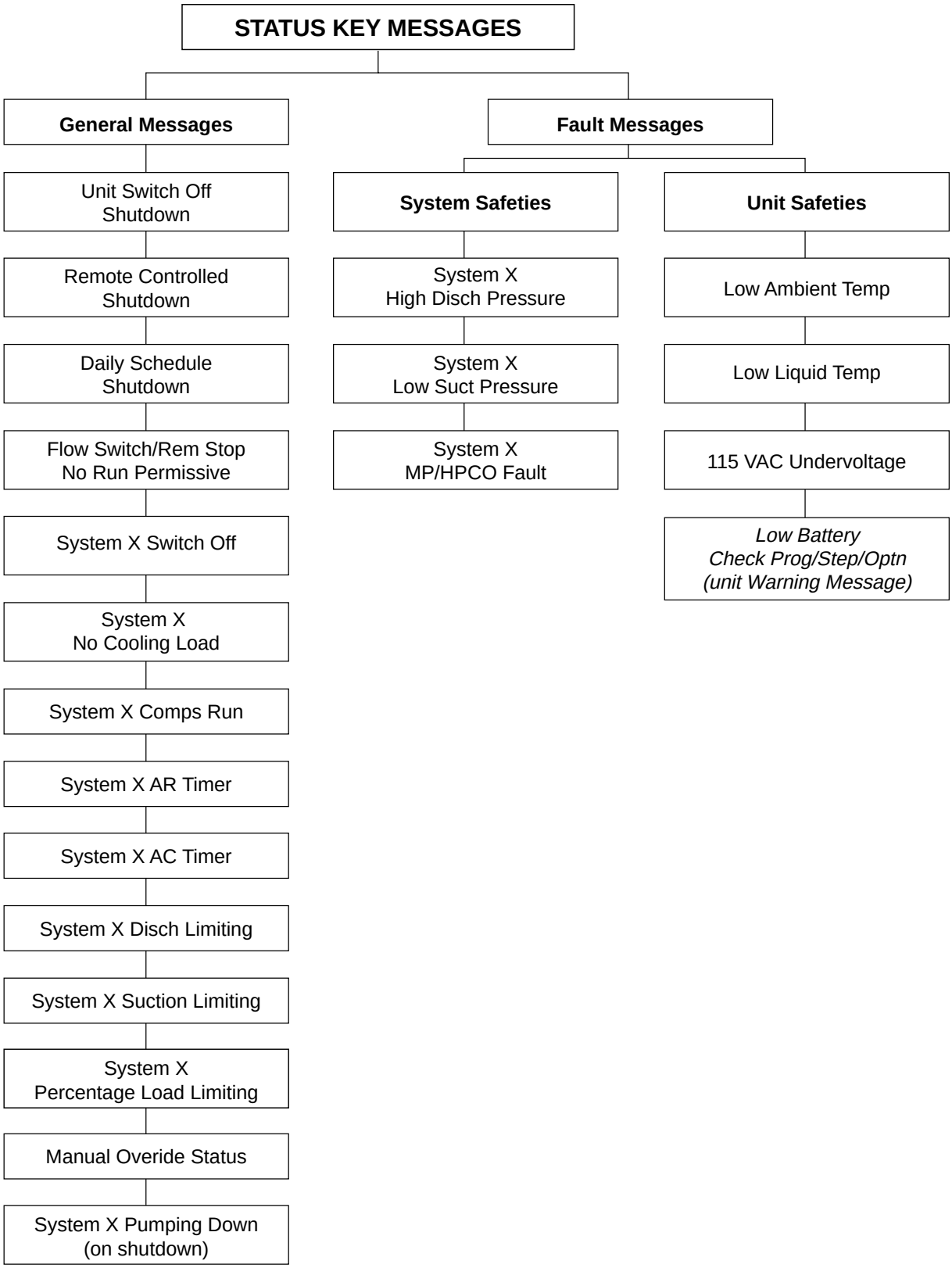
The following message is not a unit safety and will not be logged to the history buffer. It is a *unit warning* and will not auto-restart. Operator intervention is required to allow a re-start of the chiller.

!! LOW BATTERY !!
CHECK PROG / SETP / OPTN

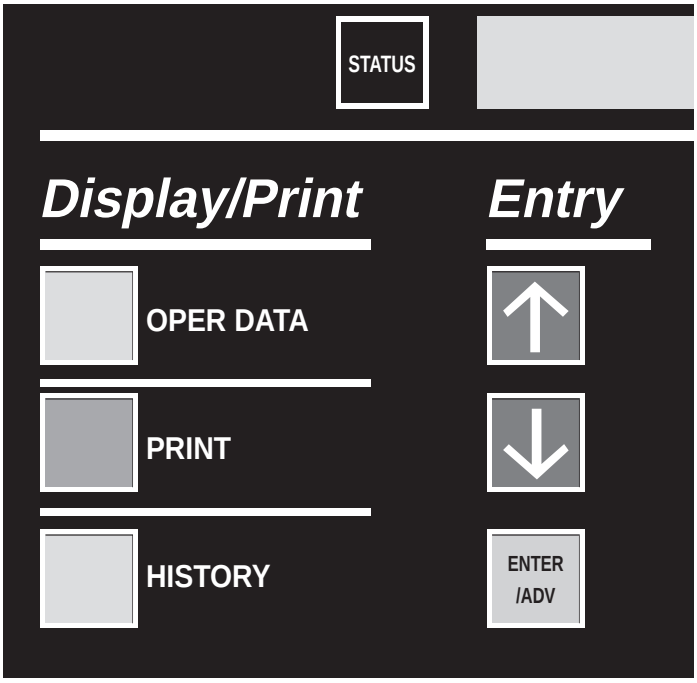
The Low Battery Warning can only occur at unit power-up. On micropanel power-up, the RTC battery is checked. If a low battery is found, all programmed setpoints, program values, options, time, schedule, and history buffers will be lost. These values will all be reset to their default values which may not be the desired operating values. Once a faulty battery is detected, the unit will be prevented from running until the PROGRAM key is pressed. Once PROGRAM is pressed the anti-recycle timers will be set to the programmed anti-recycle time to allow the operator time to check setpoints, program values, and options.

If a low battery is detected, it should be replaced as soon as possible. The programmed values will all be lost and the unit will be prevented from running on the next power interruption. The RTC/battery is located at U17 on the microboard.

TABLE 3 - STATUS KEY MESSAGES



DISPLAY / PRINT KEYS



The Display / Print keys allow the user to retrieve system and unit information that is useful for monitoring chiller operation, diagnosing potential problems, troubleshooting, and commissioning the chiller.

System and unit information, unit options, setpoints, and scheduling can also be printed out with the use of a printer. Both real-time and history information are available.

OPER DATA key

The OPER DATA key gives the user access to unit and system operating parameters. When the OPER DATA key is pressed, system parameters will be displayed and remain on the display until another key is pressed. After pressing the OPER DATA key, the various operating data screens can be scrolled through by using the UP and DOWN arrow keys located under the “ENTRY” section. With the “UNIT TYPE” programmed as a liquid chiller (under the Options key), the following is a list of operating data screens in the order that they are displayed:

```
LCHLT = 46.2°F
RCHLT = 57.4°F
```

This display shows chilled leaving and return liquid temperatures. The minimum limit on the display for these parameters are 9.2°F (-12.7°C). The maximum limit on the display is 85.4°F (29.7°C)

```
AMBIENT AIR TEMP
= 87.5°F
```

This display shows the ambient air temperature. The minimum limit on the display is 0.4°F (-17.6°C). The maximum limit on the display is 131.2°F (55.1°C).

```
SYS 1 SP =  72.1 PSIG
      DP = 227.0 PSIG
```

```
SYS 2 SP =  73.6 PSIG
      DP = 219.8 PSIG
```

These displays show suction and discharge pressures for systems 1 & 2. The discharge pressure transducer is optional on all models.

If the *optional* discharge transducer is not installed, the discharge pressure would display 0 PSIG (0 BARG).

Some models come factory wired with a low pressure switch in place of the suction transducer. In this case the suction pressure would only be displayed as the maximum suction pressure reading of > 200 PSIG (13.79 BARG) when closed, or < 0 PSIG (0 BARG) when open.

The minimum limits for the display are:
Suction Pressure : 0 PSIG (0 BARG)
Discharge Pressure : 0 PSIG (0 BARG)

The maximum limits for the display are:
Suction Pressure : 200 PSIG (13.79 BARG)
Discharge Pressure : 400 PSIG (27.58 BARG)

```
SYS X HOURS 1 = XXXXX
   2 = XXXXX,3 = XXXXX
```

```
SYS X STARTS 1 = XXXXX
   2 = XXXXX,3 = XXXXX
```

The above two messages will appear sequentially for each system. The first display shows accumulated running hours of each compressor for the specific system. The second message shows the number of starts for each compressor on each system.

```
LOAD TIMER    = 58 SEC
UNLOAD TIMER =  0 SEC
```

This display of the load and unload timers indicate the time in seconds until the unit can load or unload. Whether the systems loads or unloads is determined by how far the actual liquid temperature is from setpoint. a detailed description of unit loading and unloading is covered under the topic of Capacity Control.

```
COOLING DEMAND
2 OF 8 STEPS
```

The display of COOLING DEMAND indicates the current “step” in the capacity control scheme. The number of available steps are determined by how many compressor are in the unit. In the above display, the “2” does not mean that two compressor are running but only indicates that the capacity control scheme is on step 2 of 8. Capacity Control is covered in more detail in this publication which provides specific information on compressor staging.

```
LEAD SYSTEM IS
SYSTEM NUMBER 2
```

This display indicates the current LEAD system. In this example system 2 is the LEAD system, making system 1 the LAG compressor. The LEAD system can be manually selected or automatic. Refer to the programming under the “Options” key.

A unit utilizing hot gas bypass should be programmed for MANUAL with system 1 as the lead system. Failure to do so will prevent hot gas operation if system 2 switches to the lead system when programmed for AUTOMATIC LEAD / LAG.

EVAP PUMP IS ON
EVAP HEATER IS OFF

This display indicates the status of the evaporator pump contacts and the evaporator heater.

The evaporator pump dry contacts are energized when any compressor is running, or the unit is not OFF on the daily schedule and the unit switch is on, or the unit has shutdown on a Low Leaving Chilled Liquid fault. However, even if one of above is true, the pump will not run if the micropanel has been powered up for less than 30 seconds or if the pump has run in the last 30 seconds to prevent pump motor overheating.

The evaporator heater is controlled by ambient air temperature. When the ambient temperature drops below 40°F the heater is turned on. When the temperature rises above 45°F the heater is turned off. An under voltage condition will keep the heater off until full voltage is restored to the system.

ACTIVE REMOTE CTRL
NONE

There are several types of remote systems that can be used to control or monitor the unit. The following messages indicate the type of remote control mode active:

NONE - no remote control active. Remote monitoring may be via ISN

ISN - YorkTalk via ISN (Remote Mode)

*LOAD LIM - load limiting enabled. Can be either stage 1 or stage 2 of limiting.

*PWM TEMP - EMS-PWM temperature reset

*Refer to the section on Operating Controls

SYS X NUMBER OF
COMPS RUNNING X

SYS X RUNTIME
XX - XX - XX - XX D - H - M - S

SYS X LLSV IS ON
HOT GAS SOL IS OFF

SYS X FAN STAGE 3

The above four message will appear sequentially, first for system 1, then for system 2.

The first message indicates the system and number of compressors that are being commanded on by the microboard.

The second message indicates the system run time in days - hours - minutes - seconds. Please note that this is not accumulated run time but pertains only to the current system cycle.

The third message indicates the system, and whether the liquid line solenoid and hot gas solenoid are being commanded on by the micro board. Please note that hot gas in not available for system 2, so there is no message pertaining to the hot gas solenoid when system 2 message is displayed.

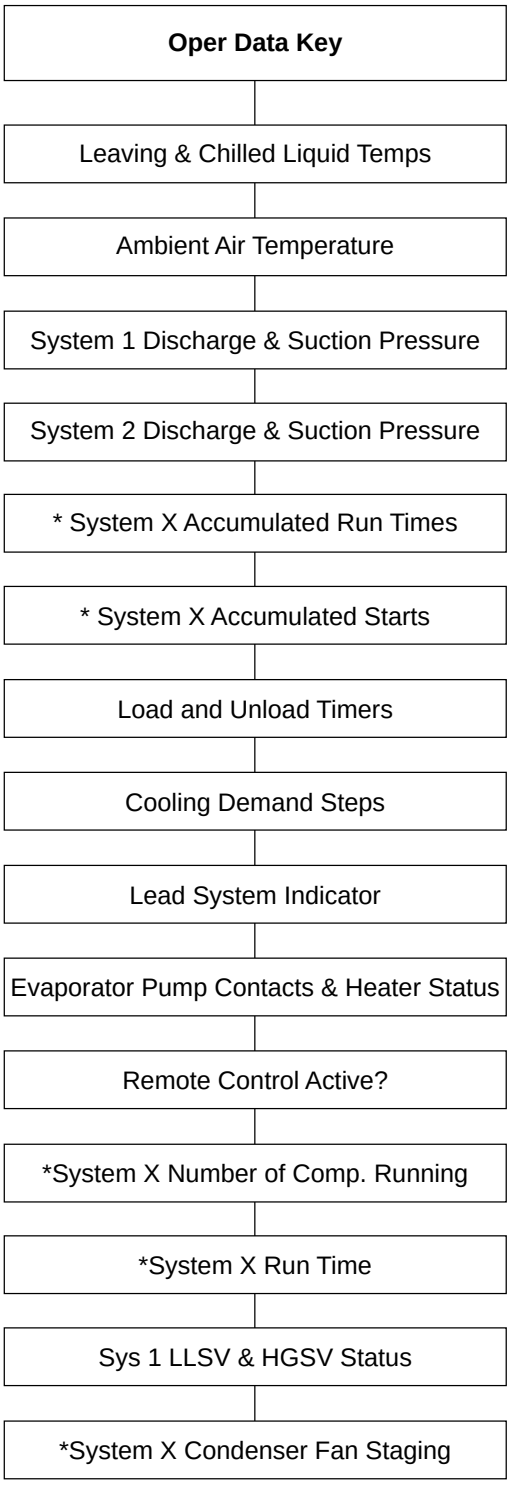
The fourth message indicates what stage of condenser fan operation is active. Unless a low ambient kit is added, only stages 1 and 2 will be used to cycle the condenser fans. However, stage 3 may be shown in this display without a low ambient kit added, but it has no effect.

See the section on Condenser Fan Control in the Unit Operation section.

OPER DATA QUICK REFERENCE LIST

The following table is a quick reference list for information available under the OPER DATA key.

TABLE 4 - OPERATION DATA


Oper Data Key
Leaving & Chilled Liquid Temps
Ambient Air Temperature
System 1 Discharge & Suction Pressure
System 2 Discharge & Suction Pressure
* System X Accumulated Run Times
* System X Accumulated Starts
Load and Unload Timers
Cooling Demand Steps
Lead System Indicator
Evaporator Pump Contacts & Heater Status
Remote Control Active?
*System X Number of Comp. Running
*System X Run Time
Sys 1 LLSV & HGSV Status
*System X Condenser Fan Staging

*Block of information repeats for each system

PRINT Key

The PRINT key allows the operator to obtain a printout of real-time system operating data or a printout of system data at the “instant of the fault” on the last six faults which occurred on the unit. An optional printer is required for the printout.

OPERATING DATA PRINT-OUT

Pressing the PRINT key and then OPER DATA key allows the operator to obtain a printout of current system operating parameters. When the OPER DATA key is pressed, a snapshot will be taken of system operating conditions and panel programming selections. This data will be temporarily stored in memory and transmission of this data will begin to the printer. A sample Oper Data printout is shown below.

YORK INTERNATIONAL CORPORATION
MILLENNIUM LIQUID CHILLER
UNIT STATUS
2 : 04PM 01 JAN 99

SYS 1	NO COOLING LOAD
SYS 2	COMPRESSORS RUNNING 2

OPTIONS

CHILLED LIQUID	WATER
AMBIENT CONTROL	STANDARD
LOCAL / REMOTE MODE	REMOTE
CONTROL MODE	LEAVING LIQUID
LEAD / LAG CONTROL	AUTOMATIC
FAN CONTROL	AMB & DSCH PRESS

PROGRAM VALUES

DSCH PRESS CUTOUT	395 PSIG
SUCT PRESS CUTOUT	44 PSIG
LOW AMBIENT CUTOUT	25.0 DEGF
LEAVING LIQUID CUTOUT	25.0 DEGF
ANTI RECYCLE TIME	600 SECS
FAN CONTROL ON PRESS	230 PSIG
FAN DIFF OFF PRESS	80 PSIG
NUMBER OF COMPRESSORS	6

UNIT DATA

RETURN LIQUID TEMP	58.2 DEGF
LEAVING LIQUID TEMP	53.0 DEGF
DISCHARGE AIR TEMP	55.3 DEGF
COOLING RANGE	42.0 +/- 2.0 DEGF
SYS 1 SETPOINT	70 +/- 3 PSIG
SYS 2 SETPOINT	70 +/- 3 PSIG
AMBIENT AIR TEMP	74.8 DEGF
LEAD SYSTEM	SYS 2
EVAPORATOR PUMP	ON
EVAPORATOR HEATER	OFF
ACTIVE REMOTE CONTROL	NONE
SOFTWARE VERSION	C.M02.01.00

SYSTEM 1 DATA

COMPRESSORS STATUS	OFF
RUN TIME	0- 0- 0- 0 D-H-M-S
SUCTION PRESSURE	66 PSIG
DISCHARGE PRESSURE	219 PSIG
SUCTION TEMPERATURE	52.5 DEGF
LIQUID LINE SOLENOID	OFF
HOT GAS BYPASS VALVE	OFF
CONDENSER FAN STAGES	OFF

SYSTEM 2 DATA

COMPRESSORS STATUS	2
RUN TIME	0- 0- 1-46 D-H-M-S
SUCTION PRESSURE	51 PSIG
DISCHARGE PRESSURE	157 PSIG
LIQUID LINE SOLENOID	ON
CONDENSER FAN STAGES	3

DAILY SCHEDULE

S M T W T F S	*= HOLIDAY
MON START = 00:00AM	STOP = 00:00AM
TUE START = 00:00AM	STOP = 00:00AM
WED START = 00:00AM	STOP = 00:00AM
THU START = 00:00AM	STOP = 00:00AM
FRI START = 00:00AM	STOP = 00:00AM
SAT START = 00:00AM	STOP = 00:00AM
HOL START = 00:00AM	STOP = 00:00AM

See Service And Troubleshooting section for Printer Installation inmformation.

HISTORY PRINT-OUT

Pressing the PRINT key and then the HISTORY key allows the operator to obtain a printout of information relating to the last 6 Safety Shutdowns which occurred. The information is stored at the instant of the fault, regardless of whether the fault caused a lockout to occur. The information is also not affected by power failures (long term internal memory battery back-up is built into the circuit board) or manual resetting of a fault lock-out.

When the HISTORY Key is pressed, a printout is transmitted of all system operating conditions which were stored at the "instant the fault occurred" for each of the 6 Safety Shutdowns buffers. The printout will begin with the most recent fault which occurred. The most recent fault will always be stored as Safety Shutdown No. 1. Identically formatted fault information will then be printed for the remaining safety shutdowns.

Information contained in the Safety Shutdown buffers is very important when attempting to troubleshoot a system problem. This data reflects the system conditions at the instant the fault occurred and often reveals other system conditions which actually caused the safety threshold to be exceeded.

The history printout is similar to the operational data printout shown in the previous section. The differences are in the header and the schedule information. The daily schedule is not printed in a history print.

One example history buffer printout is shown below. The data part of the printout will be exactly the same as the operational data part so it is not repeated here. The difference is that the Daily Schedule is not printed in the history print and the header will be as shown below.

YORK INTERNATIONAL CORPORATION
MILLENNIUM LIQUID CHILLER

SAFETY SHUTDOWN NUMBER 1
SHUTDOWN @ 3.56PM 29 JAN 99

SYS 1	HIGH DSCH PRESS SHUTDOWN
SYS 2	NO FAULTS

HISTORY DISPLAYS

The HISTORY key gives the user access to many unit and system operating parameters at the time of a unit or system safety shutdown. When the HISTORY key is pressed the following message is displayed.

DISPLAY SAFETY SHUT-DOWN NO. 1 (1 TO6)

While this message is displayed, the UP or DOWN arrow keys can be used to select any of the six history buffers. Buffer number 1 is the most recent, and buffer number 6 is the oldest safety shutdown that was saved.

After selecting the shutdown number, pressing the ENTER key displays the following message which shows when the shutdown occurred.

SHUT DOWN OCCURRED 11:23 PM 29 MAY 98

UNIT CONTROLS

The UP and DOWN arrows are used to scroll forwards and backwards through the history buffer to display the shutdown conditions. Following is a list of displayed history data screens in the order that they are displayed:

```
UNIT FAULT:
LOW LIQUID TEMP
```

```
UNIT TYPE
LIQUID CHILLER
```

```
CHILLED LIQUID
XXXXX
```

```
AMBIENT CONTROL
XXXXXXXXXX
```

```
LOCAL / REMOTE MODE
XXXXXXXXX
```

```
CONTROL MODE
LEAVING LIQUID
```

```
LEAD / LAG CONTROL
XXXXXXXX
```

```
FAN CONTROL
DISCHARGE PRESSURE
```

```
MANUAL OVERRIDE MODE
XXXXXXXXX
```

```
DISCHARGE PRESSURE
CUTOUT = XXXX PSIG
```

```
SUCTION PRESSURE
CUTOUT = XXXX PSIG
```

```
LOW AMBIENT TEMP
CUTOUT = XXX.X °F
```

```
LEAVING LIQUID TEMP
CUTOUT = XXX.X °F
```

```
FAN CONTROL ON
PRESSURE = XXX PSIG
```

```
FAN DIFFERENTIAL OFF
PRESSURE = PSIG
```

```
LCHLT = XXX.X °F
RCHLT = XXX.X °F
```

```
SETPOINT = XX.X °F
RANGE = + / - °F
```

```
AMBIENT AIR TEMP
= XXX.X °F
```

```
LEAD SYSTEM IS
SYSTEM NUMBER X
```

```
EVAP PUMP IS XXX
EVAP HEATER IS XXX
```

```
ACTIVE REMOTE CTRL
XXXX
```

```
SYS X NUMBER OF
COMPS RUNNING X
```

```
SYS X RUN TIME
XX-XX-XX-XX D-H-M-S
```

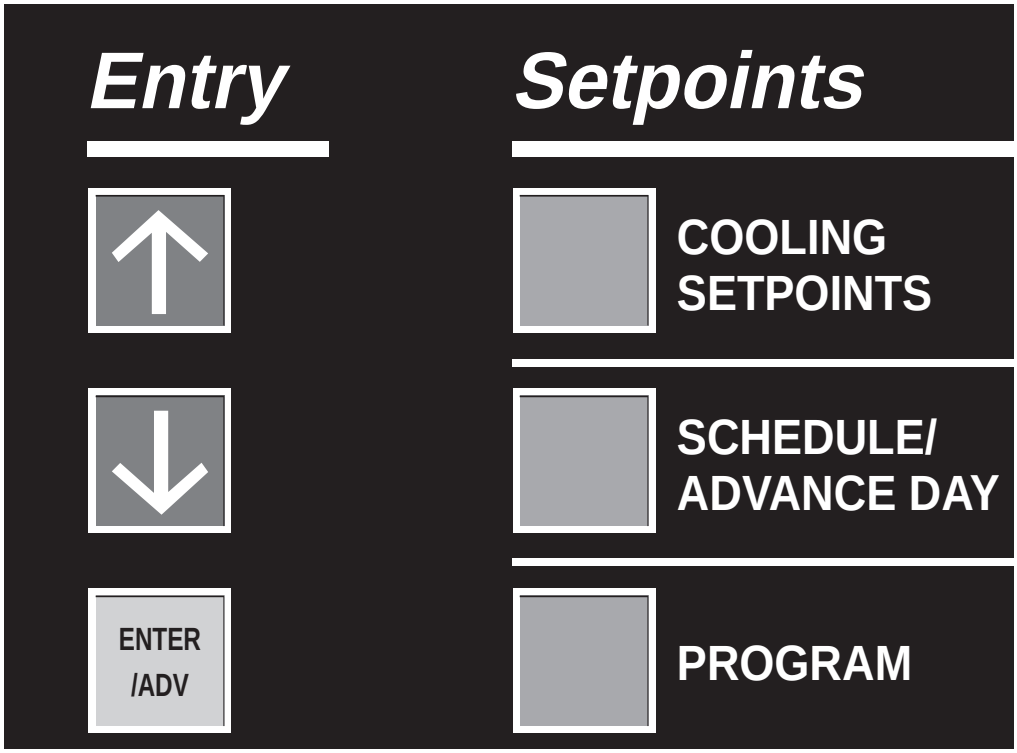
```
SYS X SP = XXXX PSIG
DP = XXXX PSIG
```

```
SYS X LLSV IS XXX
HOT GAS SOL IS XXX
```

```
SYS X FAN STAGE XXX
```

Explanation of the above displays are covered under the STATUS, DISPLAY / PRINT, SETPOINTS or UNIT keys.

“ENTRY” KEYS



The Entry Keys allows the user to view, change programmed values. The ENTRY keys consist of an UP ARROW key, DOWN ARROW key, and an ENTER / ADV key.

UP AND DOWN ARROW KEYS

Used in conjunction with the OPER DATA and HISTORY keys, the UP and DOWN arrow keys allow the user to scroll through the various data screens. Refer to the section on “Display / Print” keys for specific information on the displayed information and specific use of the UP and DOWN arrow keys.

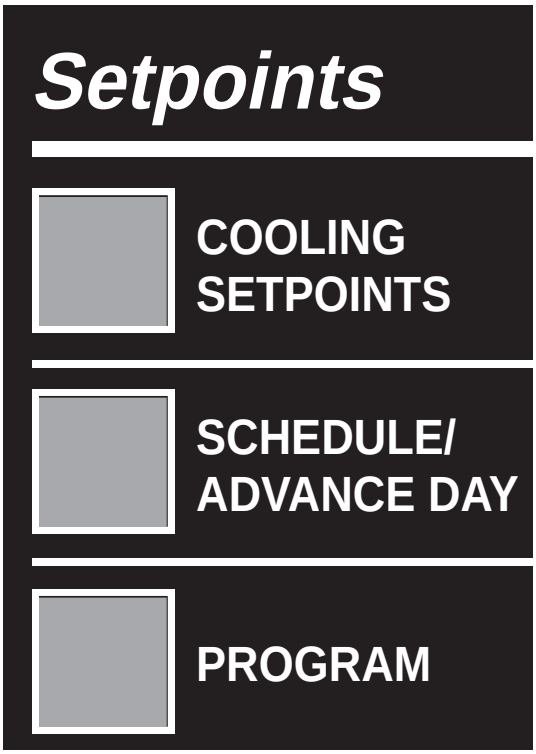
The UP and DOWN arrow keys are also used for programming the control panel such as changing cooling setpoints, setting the daily schedule, changing safety setpoints, chiller options, and setting the clock.

ENTER / ADV key

The ENTER key must be pushed after any change is made to the cooling setpoints, daily schedule, safety setpoints, chiller options and the clock. Pressing this key “enters” the new values into memory. If the ENTER key is not pressed after a value is changed, the changes will not be “entered” and the original values will be used to control the chiller.

Programming and a description on the use of the UP and DOWN arrow and ENTER / ADV keys are covered in detail under the SETPOINTS, and UNIT keys.

"SETPOINTS" KEYS



NOTE

Unit must first be programmed for "Unit Type" Liquid Chiller under Option S key to allow programming of appropriate setpoints.

Programming of the cooling setpoints, daily schedule, and safeties is accomplished by using the keys located under the SETPOINTS section.

The three keys involved are labeled COOLING SETPOINTS, SCHEDULE / ADVANCE DAY and PROGRAM.

Following are instructions for programming the respective setpoints. The same instruction should be used to view the setpoints with the exception that the setpoint will not be changed.

COOLING SETPOINTS

The Cooling setpoint and Range can be programmed by pressing the COOLING SETPOINTS key. After pressing the COOLING SETPOINTS key, the Cooling Mode (leaving chilled liquid or return chilled liquid) will be displayed for a few seconds, and then the setpoint entry screen will be displayed.

Following are the four possible message that can be displayed after pressing the COOLING SETPOINT key, indicating the cooling mode:

LOCAL LEAVING WATER TEMP CONTROL

This message indicates that the cooling setpoint is under LOCAL control. That is, the cooling setpoint is controlling to the *locally* programmed setpoint. The message also indicates that the control point is base on LEAVING water temperature out of the evaporator.

LOCAL RETURN WATER TEMP CONTROL

This message indicates that the cooling setpoint is under LOCAL control (the cooling setpoint is controlling to the *locally* programmed cooling setpoint). However, unlike the previous message, it is now indicating that the control point is based on RETURN water temperature into the evaporator.

REMOTE LEAVING WATER TEMP CONTROL

This message indicates that the cooling setpoint is under REMOTE control. When under remote control, the cooling setpoint will be determined by a remote device such as an ISN control. The message also indicates that the control point is based on LEAVING water temperature out of the evaporator.

REMOTE RETURN WATER TEMP CONTROL

This message indicates that the cooling setpoint is under REMOTE control. When under remote control, the cooling setpoint will be determined by a remote device such as an ISN control. This message also indicates that the control point is based on RETURN water temperature into the evaporator.

Immediately after the control mode message is diaplyed, the COOLING SETPOINT entry screen will be displayed. If the unit is programmed for LAEVING liquid control the following message will be displayed:

SETPOINT = 45.0°F
RANGE = +/- 2.0°F

(leaving chilled water control)

The above message shows the current chilled water temperature SETPOINT at 45.0°F (notice the cursor positioned under the number 5). Pressing either the UP or DOWN arrow will change the setpoint in .5°F increments. After using the UP and DOWN arrows to adjust to the desired setpoint, the ENTER/ADV key must be pressed to enter this number into memory and advance to the RANGE SETPOINT.

This will be indicated by the cursor moving under the current RANGE setpoint. The UP and DOWN arrow keys are used to set the RANGE, in 5°F increments, to the desired RANGE setpoint. After adjusting the setpoint, the ENTER/ADV key must be pressed to enter the data into memory.

Notice that the RANGE was programmed for +/- X.X°F. This indicates the SETPOINT to be in the *center* of the control range. If the control range mode has been programmed for RETURN LIQUID control, the message below would be displayed in place of the previous message.

SETPOINT = 45.0°F
RANGE = +2.0°F

(return chilled liquid control)

Notice that the range no longer has a +/- X.X°F, but only a + X.X°F RANGE setpoint. This indicates that the setpoint is not centered within the RANGE but could be described as the bottom of the control range A listing of the limits and the programmable values for the COOLING SETPOINT are shown in Table 4.

The SETPOINT and RANGE displays just described were based on LOCAL control. If the unit was programmed for REMOTE control (under the OPTIONS key), the above programmed setpoints would have no effect.

Both LEAVING and RETURN control are described in detail under the section on Capacity Control.

Pressing the COOLING SETPOINTS key a second time will display the remote setpoint and cooling range. This display automatically updates about every 2 seconds. Notice that these setpoints are not "locally" programmable, but are controlled by a remote device such as an ISN control. These setpoints would only be valid if the unit was operating in the REMOTE mode.

The messages below illustrate both leaving chilled liquid control and return chilled control respectively

```
REM SETP= 44.0°F
RANGE    = +/-2.0°F
```

(leaving chilled liquid control)

```
REM SETP= 44.0°F
  RANGE= 10.0°F
```

(return chilled liquid control)

The low limit, high limit, and default values for the keys under "SETPOINTS" are listed in Table 5.

Pressing the COOLING SETPOINTS a third time will bring up the display that allows the Maximum EMS-PWM Temperature Reset to be programmed. This message is shown below.

```
MAX EMS - PWM REMOTE
TEMP RESET = +20°F
```

The Temp Reset value is the maximum allowable reset of the temperature setpoint. The setpoint can be reset upwards by the use of a contact closure on the PWM Temp Reset input (CTB 1 terminals 13 - 20). See the section on Operating Controls for a detailed explanation of this feature.

As with the other setpoints, the Up Arrow and Down Arrow keys are used to change the Temp Reset value. After using the UP and DOWN ARROWS to adjust to the desired setpoint, the ENTER / ADV key must be pressed to enter this number into memory.

TABLE 5 - COOLING SETPOINTS PROGRAMMABLE LIMITS AND DEFAULTS

SETPOINT KEY	MODEL	LOW LIMIT	HIGH LIMIT	DEFAULT
LEAVING CHILLED LIQUID SETPOINT	WATER COOLING	40.0°F 4.4°C	**70.0°F 21.1°C	44.0°F 6.7°C
	GLYCOL COOLING	*10.0°F -12.2°C	**70.0°F 21.1°C	44.0°F 6.7°C
LEAVING CHILLED LIQUID CONTROL RANGE	-	1.5°F 0.8°C	2.5°F 1.4°C	2.0°F 1.1°C
RETURNED CHILLED LIQUID SETPOINT	WATER COOLING	40.0°F 4.4°C	70.0°F 21.1°C	44.0°F 6.7°C
	GLYCOL COOLING	10.0°F -12.2°C	70.0°F 21.1°C	44.0°F 6.7°C
RETURN CHILLED LIQUID CONTROL RANGE	-	4.0°F 2.2°C	20.0°F 11.1°C	10.0°F 5.6°C
MAX EMS-PWM REMOTE TEMPERATURE RESET	-	2°F 1.0°C	40°F 22.0°C	20°F 11.0°C

* Refer to Engineering Guide for operation below 30°F (-1.1°C). Alternate thermal expansion valves must be used below 30°F (-1.1°C).

* When using glycol, Leaving Chilled Liquid Setpoint should not be set below 20°F (-6.7°C).

** Do not exceed 55°F (12.8°C) setpoint before contacting the nearest York Office for application guidelines.

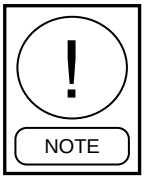
SCHEDULE / ADVANCED DAY Key

The SCHEDULE is a seven day daily schedule that allows one start/stop time per day. The schedule can be programmed Monday through Sunday with an alternate holiday schedule availabe. If no start/stop times are programmed, the unit will run on demand, providing the chiller is not shut off on a unit or system shutdown. The daily schedule is considered “not programmed” when the times in the schedule are all zeros (00:00 AM).

To set the schedule, press the SCHEDULE/ADVANCE DAY key. The display will immediately show the following display.

```
MON START = 00:00 AM
      STOP = 00:00 AM
```

The line under the 0 is the cursor. If the value is wrong. it may be changed by using the UP and DOWN arrows keys until correct. Pressing the ENTER / ADV key will enter the times and then move the cursor to the minute box. The operation is then repeated if necessary. This process may be followed until the hour, minutes, and meridian (AM or PM) of both the START and STOP points are set. After changing the meridian of the stop time, pressing the ENTER / ADV key will advance the schedule to the next day.



Whenever the daily schedule is changed for Monday, all the other days will change to the new Monday schedule. This means if the Monday times are not applicable for the whole week then the exceptional days would need to be re-programmed to the desired schedule.

To page to a specific day press the SCHEDULE / ADVANCE DAY key. The start and stop time of each day may be programmed differently using the UP and DOWN arrow, and ENTER / ADV keys.

After SUN (Sunday) schedule appears on the display a subsequent press of the SCHEDULE / ADVANCE DAY key will display the Holiday schedule. This is a two part display. The first reads:

```
HOL START = 00:00 AM
      STOP = 00:00 AM
```

The times may be set using the same procedure as described above for the days of the week. After changing the meridian of the stop time, pressing the ENTER / ADV key will advance the schedule to the following display:

```
S_M T W T F S
HOLIDAY NOTED BY *
```

The line below the empty space next to the S is the cursor and will move to the next empty space when the ENTER / ADV key is pressed. To set the Holiday, the cursor is moved to the space following the day of the week of the holiday and the UP arrow key is pressed. An * will appear in the space signifying that day as a holiday. The * can be removed by pressing the DOWN arrow key.

The Holiday schedule must be programmed weekly-once the holiday schedule runs, it will revert to the normal daily schedule.

PROGRAM Key

There are six operating parameters under the PROGRAM key that are programmable. These setpoints can be changed by pressing the PROGRAM key, and then the ENTER / ADV key to enter *Program Mode*. Continuing to press the ENTER / ADV key will display each operating parameter. While a particular parameter is being displayed, the UP and DOWN arrow keys can be used to change the value. After the value is changed, the ENTER / ADV key must be pressed to enter the data into memory. Table 6 shows the programmable limits and default values for each operating parameter.

Following are the displays for the programmable values in the order they appear:

DISCHARGE PRESSURE CUTOUT = 395 PSIG

DISCHARGE PRESSURE CUTOUT is the discharge pressure at which the system will shutdown as monitored by the *optional* discharge transducer. This is a software shutdown that acts as a backup for the mechanical high pressure switch located in the refrigerant circuit. The system can restart when the discharge pressure drops 40 PSIG (2.76 BARG) below the cutout point.

If the optional discharge pressure transducer is not installed, this programmable safety would not apply. It should be noted that every system has a *mechanical* high pressure cutout that protects against excessive high discharge pressure regardless of whether or not the optional discharge pressure is installed.

SUCTION PRESSURE CUTOUT = 44.0 PSIG

The SUCTION PRESSURE CUTOUT protects the chiller from an evaporator freeze-up. If the suction pressure drops below the cutout point, the system will shut down.

There are some exceptions when the suction pressure is permitted to temporarily drop below the cutout point. Details are explained under the topic of System Safeties.

LOW AMBIENT TEMP CUTOUT = 25.0°F

The LOW AMBIENT TEMP CUTOUT allows the user to select the chiller outside ambient temperature cutout point. If the ambient falls below this point, the chiller will shut down. Restart can occur when temperature rises 2°F (1.11°C) above the cutout setpoint.

LEAVING LIQUID TEMP CUTOUT = 36.0°F

The LEAVING LIQUID TEMP CUTOUT protects the chiller from an evaporator freeze-up. Anytime the leaving chilled liquid temperature drops to the cutout point, the chiller shuts down. Restart will be permitted when the leaving chilled liquid temperature rises 2°F (1.11°C) above the cutout setpoint.

When water cooling mode is programmed (Option key), the value is fixed at 36.0°F (2.22°C) and cannot be changed. Glycol cooling mode can be programmed to values listed in table 5.

ANTI RECYCLE TIME = 600 SEC

The anti-recycle timer message shows the amount of time left on the respective systems anti-recycle timer. The programmed ANTIRECYCLE TIME will start to count down at the start of the systems number one compressor. In effect, this is the minimum time start-to-start on the respective systems number one compressor.

Another anti-recycle timer is started each time the systems number one compressor cycles off. This anti-recycle time is fixed at 120 seconds and starts to countdown when the systems number one compressor cycles off.

The anti-recycle message is displayed when the system is unable to start due to either of the anti-recycle timers being active (counting down). The actual time displayed will be the longer of the two timers, start-to-start or stop-to-start.

FAN CONTROL ON PRESSURE = XXX PSIG

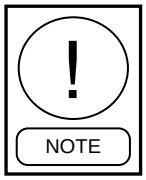
The Fan Control On Pressure is the programmed pressure value that is used to stage the condenser fans on, in relation to discharge pressure. Refer to Condenser Fan Control in the UNIT OPERATION section and Tables 14, 15, 16 and 17.

FAN DIFFERENTIAL OFF PRESSURE = XXX PSIG

The Fan Differential Off Pressure is the programmed differential pressure value that is used to stage the condenser fans off, in relation to discharge pressure. Refer to Condenser Fan Control in the UNIT OPERATION section and Tables 14,15, 16 and 17.

TOTAL NUMBER OF COMPRESSORS = 6

The TOTAL NUMBER OF COMPRESSORS are the amount of compressors in the chiller, and determines the stages of cooling available. Notice in Table 6, the chiller is a single or dual refrigerant circuit.



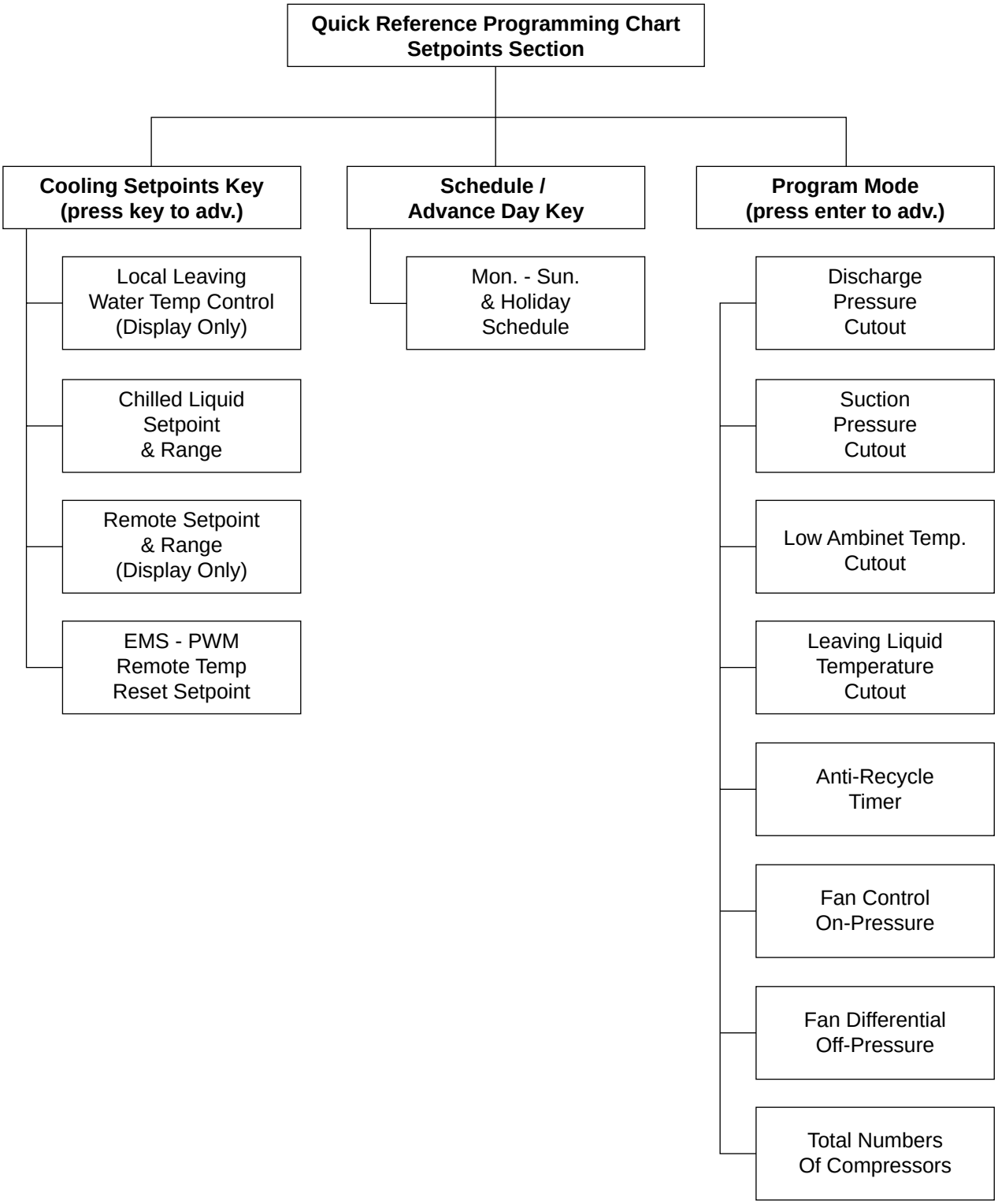
This must be programmed correctly to assure proper chiller operation.

TABLE 6 - PROGRAM KEY LIMITS AND DEFAULTS

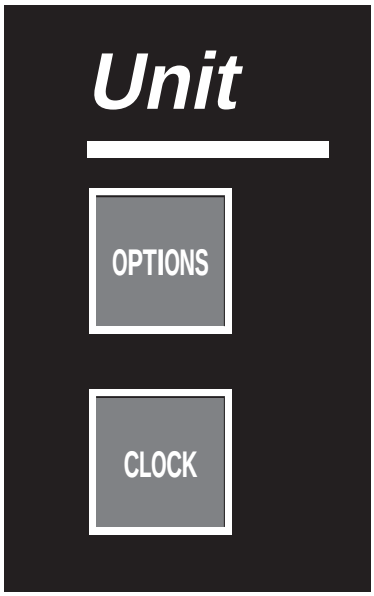
PROGRAM VALUE	MODEL	LOW LIMIT	HIGH LIMIT	DEFAULT
DISCHARGE PRESSURE CUTOUT	-	200 PSIG 13.8 BARS	399 PSIG 27.5 BARS	395 PSIG 27.2 BARS
SUCTION PRESSURE CUTOUT	WATER COOLING	44.0 PSIG 3.03 BARS	70.0 PSIG 4.83 BARS	44.0 PSIG 3.03 BARS
	GLYCOL COOLING	20.0 PSIG 1.38 BARS	70.0 PSIG 4.83 BARS	44.0 PSIG 3.03 BARS
LOW AMBIENT TEMP. CUTOUT	STANDARD AMBIENT	25.0°F -3.9°C	60.0°F 15.6°C	25.0°F -3.9°C
	LOW AMBIENT	0°F -17.8°C	60.0°F 15.6°C	25.0°F -3.9°C
LEAVING CHILLED LIQUID TEMP. CUTOUT	WATER COOLING	-	-	36°F 2.2°C
	GLYCOL COOLING	8.0°F -13.3°C	36.0°F 2.2°C	36.0°F 2.2°C
ANTI-RECYCLE TIMER	-	300 SEC.	600 SEC.	600 SEC.
FAN CONTROL ON-PRESSURE	-	225 PSIG 15.5 BARS	300 PSIG 20.7 BARS	230 PSIG 15.9 BARS
FAN DIFFERENCIAL OFF-PRESSURE	-	50 PSIG 3.45 BARS	150 PSIG 10.3 BARS	80 PSIG 5.52 BARS
TOTAL NUMBER OF COMPRESSORS	SINGLE SYSTEM	2	3	3
	TWO SYSTEMS	4	6	6

Table 7 provides a quick reference of the setpoints list for the Setpoint Keys.

TABLE 7 - SETPOINTS QUICK REFERENCE LIST



“UNIT” KEYS



OPTIONS Key

There are eleven programmable options under the OPTIONS key. The OPTIONS key is used to scroll through the list of options by repeatedly pressing the OPTIONS key. After the selected option has been displayed, the UP and DOWN arrow keys are then used to change that particular option. After the option is changed, the ENTER / ADV key must be pressed to enter the data into memory. Table 8 shows the programmable options. Following are the displays in the order they appear:

Option 1 - Language

DISPLAY LANGUAGE
ENGLISH

Option 2 - System Switches (two system units only)

SYS 1 SWITCH ON
SYS 2 SWITCH ON

This allows both systems to run
or

SYS 1 SWITCH ON
SYS 2 SWITCH OFF

This keeps system 2 off
or

SYS 1 SWITCH OFF
SYS 1 SWITCH ON

This keeps system 1 off

Option 3 - Unit Type

UNIT TYPE
LIQUID CHILLER

selected for YCAL Chillers
or

UNIT TYPE
CONDENSING UNIT

selected for YCUL Condensing units.

Option 4 - Chilled Liquid Cooling Type

CHILLED LIQUID
WATER

The chilled liquid is water. The Cooling Setpoint can be programmed from 40°F to 70°F (4.4°C to 21.1°C)

or

CHILLED LIQUID GLYCOL

The chilled liquid is glycol. The Cooling Setpoint can be programmed from 10°F to 70°F (-12.2°C to 21.1°C).

Option 5 - Ambient Control Type

AMBIENT CONTROL STANDARD

The low ambient cutout is adjustable from 25°F to 60°F (-3.9°C to 15.6°C).

or

AMBIENT CONTROL LOW AMBIENT

The low ambient cutout is programmable down to 0°F (-17.8°C). A low ambient kit MUST be installed for this option to be chosen.

Option 6 - Local / Remote Control Type

LOCAL / REMOTE MODEL LOCAL

When programmed for LOCAL, an ISN or RCC control can be used to monitor only. The micropanel will operate on locally programmed values and ignore all commands from the remote devices. The chiller will communicate and send data to the remote monitoring devices.

or

LOCAL / REMOTE MODE REMOTE

Control is to be used to control the chiller. This mode will allow the ISN to control the following items: Remote Start / Stop, Cooling Setpoint, Load Limit, and History Buffer Request. If the unit receives no valid ISN transmission for 5 minutes, it will revert back to the locally programmed values.

Option 7 - Unit Control Mode

CONTROL MODE RETURN LIQUID

Unit control is based on return chilled liquid temp. It can only be selected on units that have 4 or 6 compressors (dual system units).

or

CONTROL MODE LEAVING LIQUID

Unit control is based on leaving chilled liquid temp.

Refer to section on Capacity Control for details on loading and unloading sequences.

Option 8 - Units Type

DISPLAY UNITS IMPERIAL

Display messages will show units of measure in Imperial units (°F or PSI).

or

DISPLAY UNITS SI

Display messages will show units of measure in SI units (°C or Bar).

Option 9 - Lead / Lag Type (two systems only)

LEAD / LAG CONTROL MANUAL SYS 1 LEAD

SYS 1 selected as lead compressor.

or

LEAD / LAG CONTROL MANUAL SYS 2 LEAD

SYS 2 selected as lead compressor.

or

LEAD / LAG CONTROL AUTOMATIC

In this mode the micro determines which system is assigned to the lead and lag. A new lead / lag assignment is made whenever all compressors shut down. The micro will then assign the “lead” to the compressor with the shortest average run time.

Option 10 - Condensed Fan Control Mode

FAN CONTROL DISCHARGE PRESSURE

Condenser fans are controlled by discharge pressure only. This mode may only be chosen when discharge pressure tranducers are installed, or if fan cycling is not a concern.

or

FAN CONTROL AMBIENT & DSCH PRESS

Condenser fans are controlled by ambient temperature and discharge pressure. This mode must be chosen if the discharge pressure transducers are **not** installed, or if the fan cycling is a concern.

Option 11 - Manual Override Mode

MANUAL OVERRIDE MODE DISABLED

This option allows overriding of the daily schedule that is programmed. MANUAL OVERRIDE MODE-DISABLED indicates that override mode has no effect.

or

MANUAL OVERRIDE MODE ENABLED

Manual Override Mode is enabled. This is a service function and when enabled, will allow the unit to start when shut down on the daily schedule. It will automatically be disabled after 30 minutes.

CLOCK

The CLOCK display shows the current day, time and date. Pressing the CLOCK key will show the current day, time and date.

It is important that the date and time be correct, otherwise the daily schedule will not function as desired if programmed. In addition, for ease of troubleshooting via the History printouts, the day, time and date should be correct.

To change the day, time and date press the CLOCK key. The display will show something similar to the following:

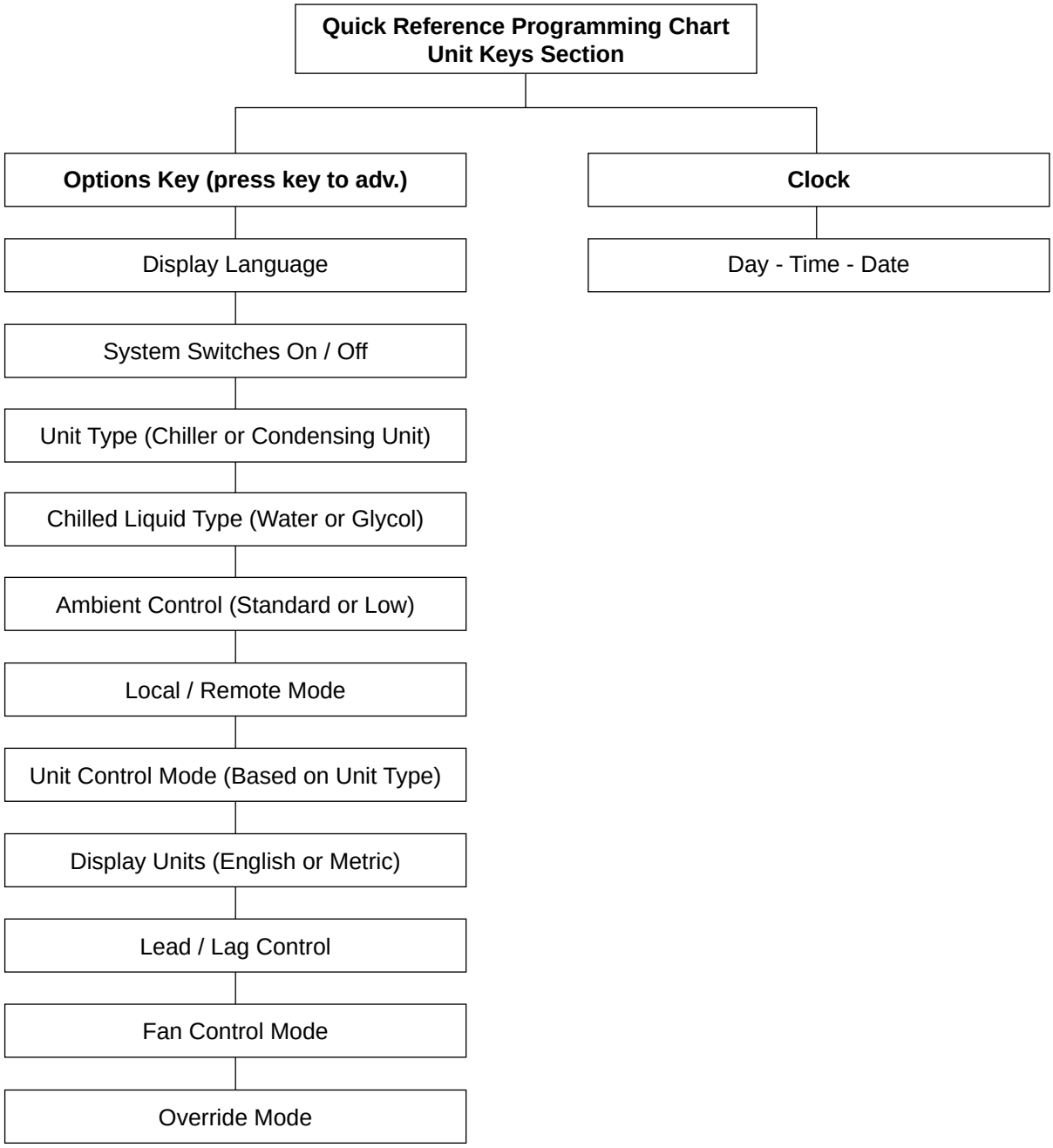
TODAY IS FRI 08:51AM 1 MAY 98

The line under the F is the cursor. If the day is correct, press the ENTER / ADV key. The cursor will move under the 0 in 08 hours. If the day is incorrect, press the UP or DOWN arrow keys until the desired day is displayed and then press the ENTER / ADV key at which time the day will be accepted and the cursor will move under the 0. In a similar manner, the hour, minute, meridian, month, day and year may be programmed, whenever the cursor is under the first letter / numeral of the item.

Jumper J11 on the microboard must be set to the “CLKON” position to turn on the clock. If this is not done the clock will not function.

Table 8 provides a quick reference list for the Unit key setpoints.

TABLE 8 - UNIT KEYS PROGRAMMING QUICK REFERENCE LIST


Quick Reference Programming Chart
Unit Keys Section
Options Key (press key to adv.)
Display Language
System Switches On / Off
Unit Type (Chiller or Condensing Unit)
Chilled Liquid Type (Water or Glycol)
Ambient Control (Standard or Low)
Local / Remote Mode
Unit Control Mode (Based on Unit Type)
Display Units (English or Metric)
Lead / Lag Control
Fan Control Mode
Override Mode
Clock
Day - Time - Date

CAPACITY CONTROL

To initiate the start sequence of the chiller, all run permissive inputs must be satisfied (flow/remote start/ stop switch), and no chiller or system faults exist.

The first phase of the start sequence is initiated by the Daily Schedule Start or a Remote Cycling Device. If the unit is shut down on the daily schedule, the chilled water pump microboard contacts (TB5 3-4) will close when the daily schedule start time has been reached. Once flow has been established and the flow switch closes, capacity functions are initiated.

If unit cycling is accomplished with a remote cycling device wired in series with flow switch, the chilled water contacts will always be energized as long as the unit switch is turned on. When the flow switch and remote cycling contacts are closed, the capacity control functions will be initiated.

It should be noted that the chilled water pump contacts (TB5 3-4) are not required to be used to cycle the chilled water pump. However, in all cases the flow switch must be closed to allow unit operation.

The control system will evaluate the need for cooling by comparing the actual leaving or return chilled liquid temperature to the desired setpoint, and regulate the leaving or return chilled liquid temperature to meet that desired setpoint.

LEAVING CHILLED LIQUID CONTROL

The setpoint, when programmed for leaving Chilled Liquid Control, is the temperature the unit will control to within +/- the cooling range. The Setpoint High Limit is the Setpoint plus the Cooling Range. The Setpoint Low Limit is the Setpoint minus the Cooling Range.

If the leaving chilled liquid temperature is above the Setpoint High Limit, the lead compressor on the lead system will be energized along with the liquid line solenoid. Upon energizing any compressor, the 60 second Anti-Coincidence timer will be initiated.

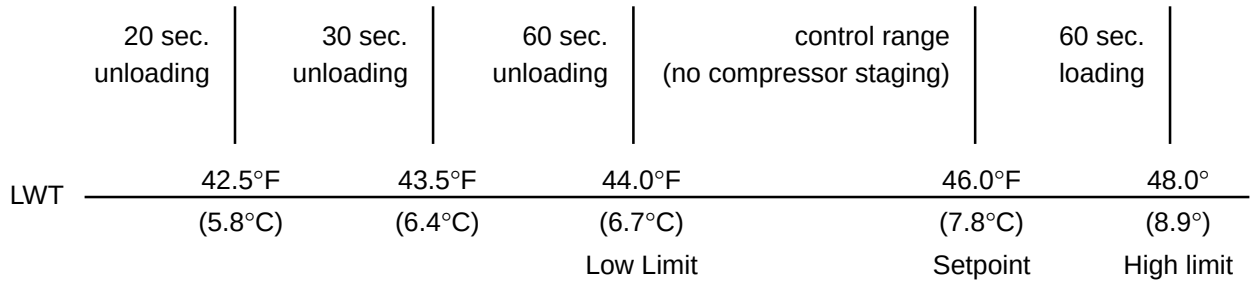
If after 60 seconds of run-time the leaving chilled liquid temperature is still above the Setpoint High Limit, the next compressor in sequence will be energized. Additional loading stages are energized at a rate of once every 60 seconds if the chilled liquid temperature remains above the Setpoint High Limit. In this case, the load timer will be 60 seconds.

If the chilled liquid temperature falls below the Setpoint High Limit but is greater than the Setpoint Low Limit, loading and unloading do not occur. This area of control is called the control range.

If the chilled liquid temperature drops to less than 0.5°F (.28°C) below the Setpoint Low Limit, unloading occurs at a rate of 60 seconds. if the chilled liquid temperature falls to a value greater than 0.5°F (.28°C) below the Setpoint Low Limit but not greater than 1.5°F (.83°C) below the Setpoint Low Limit, unloading occurs at a rate of 30 seconds. If the chilled liquid temperarure falls to a value greater than 1.5°F (.83°C) below the Setpoint Low Limit, unloading occurs at a rate of 20 seconds.

The leaving chilled liquid setpoint is programmable from 40°F to 70°F (4.4°C to 21.1°C) in water chilling mode and from 10°F to 70°F (-12.2°C to 21.1°C) in glycol chilling mode. In both modes, the cooling range can be from +/-1.5°F to +/-2.5°F (+/-.83°C to 1.39°C).

The sequences of Capacity control (compressor staging) for loading and unloading are shown in Table 9 through Table 12.



Leaving Water Temp. Control - Compressor Staging
Setpoint = 46.0°F (7.8°C) Range = +/- 2°F (1.1°C)

FIG.2 - LEAVING WATER TEMPERATURE CONTROL

TABLE 9 - LEAVING CHILLED LIQUID CONTROL FOR 6 COMPRESSORS (8 STEPS)

LEAD SYSTEM					LAG SYSTEM		
***STEP**	**COMP 1**	**COMP 2**	**COMP 3**		**COMP 1**	**COMP 2**	**COMP 3**
0	OFF	OFF	OFF		OFF	OFF	OFF
1	ON+HG	OFF	OFF	SEE NOTE 1	OFF	OFF	OFF
2	ON	OFF	OFF		OFF	OFF	OFF
3	ON	OFF	OFF	SEE NOTE 2	ON	OFF	OFF
4	ON	ON	OFF	SEE NOTE 3	OFF	OFF	OFF
5	ON	ON	OFF		ON	OFF	OFF
6	ON	ON	OFF		ON	ON	OFF
7	ON	ON	ON		ON	ON	OFF
8	ON	ON	ON		ON	ON	ON

TABLE 10 - LEAVING CHILLED LIQUID CONTROL FOR 4 COMPRESSORS (6 STEPS)

LEAD SYSTEM				LAG SYSTEM	
***STEP**	**COMP 1**	**COMP 2**		**COMP 1**	**COMP 2**
0	OFF	OFF		OFF	OFF
1	ON+HG	OFF	SEE NOTE 1	OFF	OFF
2	ON	OFF		OFF	OFF
3	ON	OFF	SEE NOTE 2	ON	OFF
4	ON	ON	SEE NOTE 3	OFF	OFF
5	ON	ON		ON	OFF
6	ON	ON		ON	ON

* STEP can be viewed using the OPER DATA key and scrolling to COOLING DEMAND.

TABLE 11 - LEAVING CHILLED LIQUID CONTROL FOR 3 COMPRESSORS (SINGLE SYSTEM)

*STEP	COMP 1	COMP 2	COMP 3	
0	OFF	OFF	OFF	
1	ON+HG	OFF	OFF	SEE NOTE 1
2	ON	OFF	OFF	
3	ON	ON	OFF	
4	ON	ON	ON	

TABLE 12 - LEAVING CHILLED LIQUID CONTROL FOR 2 COMPRESSORS (SINGLE SYSTEM)

*STEP	COMP 1	COMP 2	
0	OFF	OFF	
1	ON+HG	OFF	SEE NOTE 1
2	ON	OFF	
3	ON	ON	

Notes:

1. Step 1 is Hot Gas Bypass and is skipped when loading occurs. Hor Gas Bypass operation is inhibited during Pumpdown. For leaving Chilled Liquid Control the Hot Gas Bypass solenoid is energized only when the lead compressor is running and the LWT < SP, the Hot Gas Bypass solenoid is turned off when the LWT > SP + CR/2
2. Step 3 is skipped when loading occurs.
3. Step 4 is skipped when unloading occurs.

*STEP can be viewed using the OPER DATA key and scrolling to COOLING DEMAND.

RETURN CHILLED LIQUID CONTROL (DUAL SYSTEM 4 AND 6 COMP UNITS ONLY)

Return chilled liquid control is based on staging the compressors to match the cooling load. The chiller will be fully loaded when the return water temperature is equal to the Cooling Setpoint plus Range Setpoint. The chiller will be totally unloaded (all compressors off) when the return water temperature is equal to the Cooling Setpoint. At return water temperatures between the Cooling Setpoint, and Cooling Setpoint plus Range Setpoint, compressor loading and unloading will be determined by the formulas in Table 14 or table 15.

Normal loading will occur at intervals of 60 seconds accroding to the temperatures determined by the formulas. Unloading will occur at a rate 30 seconds accroding the temperatures determined in the formulas.

The return chilled liquid setpoint is programmable from 40°F to 70°F (4.4°C to 21.1°C) in water chilling mode and from 10°F to 70°f (-12.2°C to 21.1°C) in glycol chilling mode. In both modes, the cooling range can be from 4°F to 20°F (2.2° to 11.1°C).

As an example of compressor staging (refer to Table 13 and Table 14), a chiller with six compressors using a Cooling Setpoint programmed for 45°F (7.20°C) and a Range Setpoint of 10°F (5.56°C). Using the formulas in Table 14, the control range will be split up into six (seven including hot gas) segments, with the Control Range determining the separation between segments. Note also that the Cooling Setpoint is the point at which all compressors are off, and cooling Setpoint plus Range Setpoint is the point all compressors are on. Specifically, if the return water temperature is 55°F (12.8°C), then all compressors will be on, providing full capacity. At nominal gpm, this would provide approximately 45°F (7.2°C) leaving water temperature out of the evaporator.

If the return water temperarute drops to 53.3°F (11.8°C), one compressor would cycle off leaving five compressor running. The compressors would continue to cycle off approximately every 1.7°F (.94°C), with the exception of hot gas bypass. Notice taht the hot gas bypass would be available when the return water tempreature dropped to 46.25°F (7.9°C). At this point one compressor would be running.

Should the return water temperature rise from this point to 46.7°F (8.2°C), the hot gas bypass would shut off, still leaving one compressor running. As the load increased, the compressors would stage on every 1.7°F (.94°C).

Also notice that Tables 14 and 15 not only provide the formulas for the loading (ON POINT) and unloading (OFF POINT) of the system, the “STEP” is also shown in the tables. The “STEP” is that sequence in the capacity control scheme that can be viewed under the OPER DATA key. Please refer to the section on the DISPLAY/PRINT keys for specific information on the OPER DATA key.

COMPRESSOR STAGING FOR RETURN WATER CONTROL - 6 COMPRESSORS COOLING SETPOINT = 45° F (7.2° C) RANGE = 10° F (5.6° C)

TABLE 13 - COMPRESSOR STAGING FOR RETURN WATER CONTROL

#OF COMP ON	0	*1+HG	1	2	3	4	5	6
RWT	45°F (7.2°C)	46.25°F (7.9°C)	46.7°F (8.2°C)	48.3°F (9.1°C)	50.0°F (10.0°C)	51.7°F (11.0°C)	53.4°F (11.9°C)	55.0°F 12.8°C)

*Unloading only

TABLE 14 - RETURN CHILLED LIQUID CONTROL FOR 6 COMPRESSOR (8 STEPS)

*STEP	COMPRESSOR ON POINT	COMPRESSOR OFF POINT	
0			
1		SETPOINT	
2	SP + CR/6	SP + CR/8	SEE NOTE 1
3	SP + 2*CR/6	SP + CR/6	SEE NOTE 2
4	SP + 2*CR/6	SP + CR/6	SEE NOTE 3
5	SP + 3*CR/6	SP + 2*CR/6	
6	SP + 4*CR/6	SP + 3*CR/6	
7	SP +5*CR/6	SP + 4*CR/6	
8	SP + CR	SP + 5*CR/6	

TABLE 15 - RETURN CHILLED LIQUID CONTROL FOR 4 COMPRESSOR (6 STEPS)

*STEP	COMPRESSOR ON POINT	COMPRESSOR OFF POINT	
0			
1		SETPOINT	
2	SP + CR/4	SP + CR/8	SEE NOTE 1
3	SP + 2*CR/4	SP + CR/4	SEE NOTE 2
4	SP + 2*CR/4	SP + CR/4	SEE NOTE 3
5	SP + 3*CR/4	SP + 2*CR/4	
6	SP + CR	SP + 3*CR/4	

Notes:
1. Step 1 is Hot Gas Bypass and is skipped when loading occurs. Hot Gas Bypass operation is inhibited during Pumpdown.
2. Step 3 is skipped when loading occurs.
3. Step 4 is skipped when unloading occurs.

*STEP can be viewed using the OPER DATA key and scrolling to COOLING DEMAND.

EVAPORATIOR PUMP CONTROL

The evaporator pump dry contacts (CTB2 - terminals 23 - 24) are energized when any of the following conditions are true:

1. Low Leaving Chilled Liquid Fault
2. Any Compressor is running
3. Daily Schedule is not programmed OFF and Unit Switch is ON.

The pump will not run if the micropanel has been powered up for less than 30 seconds or if the pump has run in the last 30 seconds to prevent pump motor overheating.

EVAPORATOR HEATER CONTROL

The evaporator heater is controlled by ambient air temperature. When the ambient temperature drops below 40°F (4.4°C) the heater is turned on. When the temperature rises above 45°F (7.2°C) the heater is turned off. An under voltage condition will keep the heater off until full voltage is restored to the system.

CONDENSER FAN CONTROL

Condenser fan operation must be programmed with the Options key under “Fan Control.” Condenser fan control can be selected for Ambient Temp. and Dish. Pressure, or Discharge Pressure Only.

The condenser fan control by “Ambient Temperature and Discharge Pressure” is a feature that is integral to the standard software control. If the optional discharge transducer is not installed, the condenser fans will operate based on outdoor ambient temperature only. See Table 16.

The condenser fan control by “ Discharge Pressure” is a feature that can be selected if the discharge pressure transducer is installed and fan recycling is not a concern. Fan control by discharge pressure will work accroding to Table 16. The fan control on-pressure (ctrl_press) and fan differencial off-pressure (diff_press) are programmable under the PROGRAM key.

TABLE 16 - CONDENSER FAN CONTROL USING OUTDOOR AMBIENT TEMPERATURE AND DISCHARGE PRESSURE

FAN STAGE	ON	OFF
1 **1 FAN FWD**	OAT > 25°F (-3.9°C) OR DP > ctrl_press	OAT < 20°F(-6.7°C) AND DP < ctrl_press - diff_press
2 **2 FANS FWD**	OAT > 45°F (7.2°C) OR DP > ctrl_press + 20 PSIG (1.38 Bars)	OAT < 40°F(4.4°C) AND DP < ctrl_press - diff_press + 20 PSIG (1.38 Bars)

TABLE 17 - CONDENSER FAN CONTROL USING DISCHARGE PRESSURE ONLY

FAN STAGE	ON	OFF
1 **1 FAN FWD**	DP > ctrl_press	DP > ctrl_press - diff_press
2 **2 FANS FWD**	DP > ctrl_press + 20 PSIG (1.38 Bars)	DP < ctrl_Press - diff_press + 20 PSIG (1.38 Bars)

LOW AMBIENT CONDENSER FAN CONTROL

For unit operation below 25°F (-3.9°C) a low ambient kit is requried. The kit consists of a discharge pressure tranducer(s) and reversing contactors.

With the low ambient kit installed and the unit programmed for low ambient operation, the condenser fans will operate as shown in Tables 18 and 19.

Again, notice that condenser fan operation can be programmed for either “temperature and discharge pressure control,” or “discharge pressure control only” as described under Condenser Fan Control.

The fan control on-pressure (ctrl_press) and the fan differencial off-pressure (diff_press) are programmable under the PROGRAM key.

TABLE 18 - LOW AMBIENT CONDENSER FAN CONTROL - AMBIENT TEMPERATURE AND DISCHARGE PRESSURE CONTROL

FAN STAGE	ON	OFF
1 **1 FAN REV**	OAT > 25°F (-3.9°C) OR DP > ctrl_press	OAT < 20°F(-6.7°C) AND DP > ctrl_press - diff_press
2 **1 FAN FWD**	OAT > 45°F (7.2°C) OR DP > ctrl_press + 20 PSIG (1.38 Bars)	OAT < 40°F(-4.40°C) AND DP < ctrl_press - diff_press + 20PSIG (1.38 Bars)
3 **2 FANS FWD**	OAT > 65°F (18.3°C) OR DP > ctrl_press + 40 PSIG (2.76 Bars)	OAT < 60°F(15.6°C) AND DP < ctrl_press - diff_press + 40PSIG (2.76 Bars)

TABLE 19 - LOW AMBIENT CONDENSER FAN CONTROL - DISCHARGE PRESSURE CONTROL

FAN STAGE	ON	OFF
1 **1 FAN REV**	DP > ctrl_press	DP > ctrl_press - diff_press
2 **1 FAN FWD**	DP > ctrl_press + 20 PSIG (1.38 Bars)	DP < ctrl_press - diff_press + 20 PSIG (1.38 Bars)
3 **2 FANS FWD**	DP > ctrl_press + 40 PSIG (2.76 Bars)	DP < ctrl_press - diff_press + 40 PSIG (2.76 Bars)

PUMPDOWN (LLSV) CONTROL

Each system has a Pumpdown feature upon shut-off. On a non-safety, non-unit switch shutdown, all compressors but one in the system will be shut off. The LLSV will also be turned off. The final compressor will be allowed to run until the suction pressure falls below the cutout or for 180 seconds, which ever comes first. Manual pumpdown from the keypad is not possible.

LOAD LIMITING

Load Limiting is a feature that prevents the unit from loading beyond the desired value. 2 and 4 compressor units can be load limited to 50%. This would allow only 1 compressor per system to run. 3 and 6 compressor units can be load limited to 33% or 66%. The 66% limit would allow up to 2 compressors per system to run, and the 33% limit would allow only 1 compressor per system to run. No other values of limiting are available.

These are two ways to load limit the unit. The first is through remote communication via an ISN.

A second way to load limit the unit is through closing contacts connected to Load Limit (CTB-Terminals 13-21) and PWM inputs (CTB1-Terminals 13-20). Stage 1 of load limiting involves closing the Load Limit input. Stage 2 of load limiting involves closing both the Load Limit and PWM inputs. The first stage of limiting is either 66% or 50%, depending on the number of compressors on the unit. The second stage of limiting is 33% and is only available on 3 and 6 compressor units. Table 20 shows the load limiting permitted for the various number of compressors.

NOTE:
Simultaneous operation of Load Limiting and EMS-PWM Temperature Reset (described on following pages) cannot occur.

COMPRESSOR RUN STATUS

Compressor run status is indicated by closure of contacts at CTB2 - terminals 25 to 26 for system 1 and CTB2 - terminals 27 to 28 for system 2.

ALARM STATUS

System or unit shutdown is indicated by normally-open alarm contacts opening whenever the unit shuts down on a unit fault, or locks out on a system fault. System 1 alarm contacts are located at CTB2 - terminals 29 to 30. System 2 alarm contacts are located at CTB2 - terminals 31 to 32. The alarm contacts will close when condition allow the unit to operate.

COMPRESSOR SEQUENCING

The unit control will attempt to equalize the total run hours on individual compressors within a system. When a system is about to start, the compressor with the least run time in that system will be the first to start. When the system has to load, the next compressor to start will be the one with the least run time that is currently not running in that system.

TABLE 20 - COMPRESSOR OPERATION - LOAD LIMITING

COMPRESSORS IN UNIT	STAGE 1	STAGE 2
2	50%	-
3	66%	33%
4	50%	-
6	66%	33%

EMS-PWM REMOTE TEMPERATURE RESET

EMS-PWM Remote Temperature Reset is a value that resets the Chilled Liquid Setpoint based on a PWM input (timed contact closure) to the microboard. This PWM input would typically be supplied by an Energy Management System.

A contact closure on the PWM Temp Reset input at CTB 1 terminals 13-20, will reset the chilled liquid setpoint based on the length of time the contacts remain closed. The maximum temperature reset is achieved at a contact closure of 11 seconds. This is the longest contact closure time allowed. One second is the shortest time allowed and causes the Chilled liquid Setpoint to revert back to the Local programmed value. The reset value is always added to the Chilled Liquid Setpoint, meaning that this function never lowers the Chilled Liquid Setpoint below the locally programmed value; it can only reset to a higher value. The microboard must be refreshed between 30 seconds and 30 minutes. Any contact closure occuring sooner than 30 seconds will be ignored. If more than 30 minutes elapse before the next contact closure, the setpoint will revert back to the locally programmed value. The new chilled liquid setpoint is calculated by the following equations:

setpoint = local chilled liquid setpoint + °reset

$$°\text{reset} = (\text{Contact Closure} - 1) \times \frac{(*\text{Max. Reset Value})}{10}$$

Example:
Local Chilled Liquid Setpoint = 45°F (7.22°C)
*Max Reset Value = 10°F (5.56°C)
Contact Closure Time = 6 Seconds.

(English)
(6 sec. - 1) (10°F/10) = 5°F Reset

So...the new chilled liquid setpoint = 45°F + 5°F = 50°F. This can be viewed by pressing the Cooling Setpoints key twice. The new value will be displayed as "REM SETP = 50.0°F."

(Metric)
(6 sec - 1) * (5.56°C/10) = 2.78°C
Reset Cooling Setpoint = 7.22°C + 2.78°C = 10.0°C

So...the new reset Cooling Setpoint = 7.22°C + 2.78°C = 10°C. This can be viewed by pressing the Cooling Setpoints key twice. The new value will be displayed as "REM SETP = 10.0°C."

BAS/EMS TEMPERATURE RESET OPTION

The Remote Reset Option allows the Control Center of the unit to reset the chilled liquid setpoint using a 0 - 10 VDC input, a 4 - 20 ma input, or a contact closure input. The Remote Reset circuit board converts the signals mentioned above into pluse width modulated (PWM) signals which the microprocessor can understand. Whenever a reset is called for, the change may be noted by pressing the cooling Setpoints key twice. The new value will be displayed as "REM SETP = XXX°F"

The optional Remote Reset option would be used when reset of the chilled liquid setpoint is required and a PWM signal (timed contact closure) cannot be supplied by an Energy management System. The Remote Temp. Reset Board will convert a voltage, current, or contact signal that is available from an EMS to a PWM signal, and every 80 seconds provide a PWM input to the microboard.

If a **0 - 10 VDC** Signal is available, it is applied to terminals A+ and A-, and **jumpers are applied to JU4 and JU2** on the reset board. This dc signal is conditioned to a 1 - 11 second PWM output and supplied to the PWM input on the microboard at CTB 1 terminals 13 - 20. To calculate the reset chilled liquid setpoint for values between 0 VDC and 10 VDC use the following formula:

setpoint = local chilled liquid setpoint + °reset

$$°\text{reset} = \frac{(\text{dc voltage signal}) \times (*\text{Max Reset Value})}{10}$$

Example:
Local Chilled Liquid Setpoint = 45°F (7.22°C)
*Max Reset Value = 20°F (11.11°C)
Input Signal = 6 VDC

(English)

$$°\text{reset} = \frac{6\ \text{VDC} \times 20°\text{F}}{10} = 12°\text{F reset}$$

setpoint = 45°F + 12°F = 57°F

(Metric)

$$°\text{reset} = \frac{6\ \text{VDC} \times 11.11°\text{C}}{10} = 6.67°\text{C reset}$$

setpoint = 7.22° + 6.67°C = 13.89°C

* Max Reset Value is the "Max EMS-PWM Remote Temp. Reset" setpoint value described in the programming section under Cooling Setpoints. Programmable values are from 2°F to 40°F (1.11°C to 22.22°C).

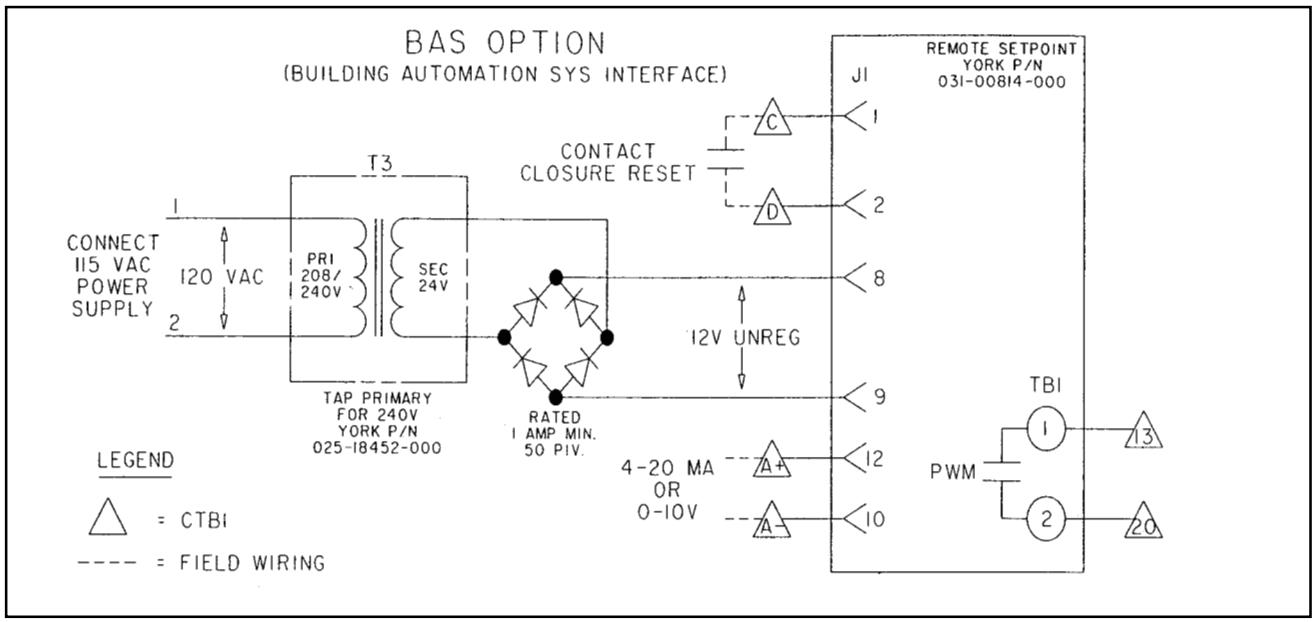


FIG. 3 - FIELD AND FACTORY ELECTRICAL CONNECTIONS OPTIONAL REMOTE TEMPERATURE RESET BOARD

If a **4 - 20 ma signal is available**, it is applied to terminals A+ and A- and **jumpers are applied JU5 and JU3** on the reset board. The ma signal is conditioned to a 1-11 second PWM output. The PWM output is then supplied to the PWM input on the microboard at CTB 1 terminals 13 - 20. To calculate the chilled liquid setpoint for value between 4 ma and 20 ma use the following formula:

setpoint = local chilled liquid setpoint = °reset

$$\text{°reset} = \frac{(\text{ma signal} - 4) \times (\text{*Max reset Value})}{16}$$

Example:
Local Chilled Liquid Setpoint = 45° (7.22°C)
*Max Reset Value = 10°F (5.56°C)
Input Signal = 12 ma

(English)

$$\text{°reset} = \frac{8 \text{ ma} \times 10\text{°F}}{16} = 5\text{°F reset}$$

setpoint = 45°F + 5°F = 50°F

(Metric)

$$\text{°reset} = \frac{8 \text{ ma} \times 5.56\text{°C}}{16} = 2.78\text{°C reset}$$

setpoint = 7.22°C + 2.78°C = 10.0°C

NOTE

A 240-24 Volt Ratio Transformer (T3) is used to derive nominal 12 volt output from the 120 volt supply.

If the **Contact Closure input** is used. The connections are made to terminals C and D and only **jumper JUI must be in place** on the reset board. This input is used when a *single* reset value is needed. When the contacts are closed, the remote temperature reset board will convert this contact closure to a PWM signal that is applied to CTB 1 terminals 13 - 20.

To set the PWM output, the contacts must be closed on inputs C - D, and potentiometer R11 (located on the front edge of the PC board) is adjusted to 10 VDC as measured at TP3 to terminal 10 on the circuit board. The reset value will be the “Max EMS-PWM Remote Temp. Reset” setpoint value programmed in the SETPOINTS section under the Cooling Setpoints key.

NOTE:
The coil of any added relay used for reset must be suppressed to prevent possible component damage. Use YORK PN031-00808-00 suppressor.

* Max Reset Value is the “Max EMS-PWM Remote Temp. Reset” setpoint value described in the programming section under Cooling Setpoints. Programmable values are from 2°F to 40°F (1.11°C to 11.11°C).

CLEARING HISTORY BUFFERS

The history buffers may be cleared by pressing the HISTORY key and then repeatedly pressing the UP arrow key until you scroll past the last history buffer choice. The following message will be displayed:

INITIALIZE HISTORY
ENTER = YES

Pressing the ENTER / ADV key at this display will cause the history buffers to be cleared. Pressing any other key will cancel the operation.

SOFTWARE VERSION

The software version may be viewed by pressing the HISTORY key and then repeatedly pressing the DOWN arrow key until you scroll past the first history buffer choice. The following message is an example of what will be displayed:

SOFTWARE VERSION
C.MMC.01.01

SERVICE MODE

Service Mode is a mode that allows the user to view all the inputs to the microboard and enable or disable all of the outputs (except compressors) on the unit. Some internal timer and counters will be viewable and modifiable as well.

To enter Service Mode, turn the unit switch off and press the following keys in the sequence shown; PROGRAM, UP ARROW, UP ARROW, DOWN ARROW, DOWN ARROW, ENTER.

SERVICE MODE - DIGITAL OUTPUTS

After pressing the key sequence as discribed, the control will enter the Service Mode permitting the *digital outputs (except compressors), operating hours, and start counters to be viewed / modified.* The ENTER / ADV key is used to advance through the digital outputs. Using the UP / DOWN ARROW keys will turn the respective digital output on/off.

Following is the order of digital outputs that will appear as the ENTER / ADV key is pressed:

SYS 1 COMPRESSOR 1
SYS 1 LIQUID LINE SOLENOID VALVE
SYS 1 COMPRESSOR 2
SYS 1 COMPRESSOR 3
SYS 1 HOT GAS BYPASS SOLENOID VALVE
SYS 2 COMPRESSOR 1
SYS 2 LIQUID LINE SOLENOID VALVE
SYS 2 COMPRESSOR 2
SYS 2 COMPRESSOR 3
SYS 1 FAN STAGE 1
SYS 1 FAN STAGE 2
SYS 1 FAN STAGE 3
SYS 2 FAN STAGE 1
SYS 2 FAN STAGE 2
SYS 2 FAN STAGE 3
EVAPORATOR HEATER
SYS 1 ALARM
SYS 2 ALARM
EVAPORATOR PUMP
SYS 1 & 2 ACCUM RUN TIME/STARTS

Each display will also show the output connection on the microboard for the respective digital output status shown.
For example:

SYS 1 LLSV STATUS
TB3 - 2 IS OFF

This display indicates that the system 1 liquid line solenoid valve is OFF, and the output connection from the microboard is coming from terminal block 3 - pin 2.

Pressing the UP Arrow key will energize the liquid line solenoid valve and OFF change to ON in the display as the LLSV is energized.

The last display shown on the above list is for the accumulated run and start timers for each system. These values can also be changed using the UP and DOWN ARROW keys, but under normal circumstances would not be advised.

SERVICE MODE - INPUTS

After entering the service Mode, *all digital and analog inputs to the microboard can be viewed by pressing the OPER DATA key*. After pressing the OPER DATA key, the UP ARROW and DOWN ARROW keys are used to scroll through the analog and digital inputs.

Following is the order of analog and digital inputs that will appear when sequenced with the ARROW keys:

(analog inputs)

SYS 1 *SUCT PRESSURE
SYS 1 SPARE
SYS 1 **DISCH PRESSURE
SYS 1 SUCT TEMP (YCUL ONLY)
SYS 2 SUCT TEMP (YCUL ONLY)
SPARE
SPARE
AMBIENT AIR
LEAVING LIQUID
RETURN LIQUID
SYS 2 *SUCTION PRESSURE
SYS 2 SPARE
SYS 2 **DISH PRESSURE
SYS 1 GRAND FLT
SYS 2 GRAND FLT

(binary inputs)

PWM TEMP RESET INPUT
LOAD LIMIT INPUT
FLOW SW / REM STSRT
SYS 2 ZONE THERM (YCUL ONLY)
SINGLE SYSTEM SELECT
SYS 1 MP / HPCO INPUT
SYS 2 MP / HPCO INPUT

The analog inputs will display tha input connection, the temperature or pressure, and corresponding input voltage such as:

```
SYS 1 SUCT PR J4-10
2.1 VDC = 81 PSIG
```

This example indicates that the system 1 suction pressure input is connected to plug 4 - pin 10 (J4-10) on the microboard. It indicates that the voltage is 2.1 volts dc which corresponds to 81 PSIG (5.6 bar) suction pressure.

The digital inputs will display the input connection and ON/OFF status such as:

```
FLOW SW / REM START
J9 - 5 IS ON
```

This indicates that the flow switch/remote start input is connected to plug 9-pin 5 (J9-5) on the microboard, and is ON (ON = +30 vdc unregulated input, OFF = O VDC input on digital inputs).

CONTROL INPUTS / OUTPUTS

Tables 21 and 22 are a quick referance list providing the connection points and a description of the binary and analog inputs respectively. Table 23 lists the connection points for the outputs. All input and output connections pertain to the connections at the microboard.

Figure 4 illustrates the physical connections on the microboard.

** The discharge pressure transducer is optional on all models.

TABLE 21 - MICROBOARD BINARY INPUTS

*J9-1	30VDC UNREGULATED SUPPLY
J9-2	UNIT ON/OFF SWITCH
J9-3	PWM TEMP RESET OR LOAD LIMIT STAGE 2 ON 3 & 6 COMP UNITS
J9-4	LOAD LIMIT STAGE 1
J9-5	FLOW SWITCH AND REMOTE START / STOP (SYS1 ZONE THERMOSTAT - YCUL ONLY)
J9-6	SYSTEM 2 ZONE THERMOSTAT - YCUL ONLY
J9-7	SINGLE SYSTEM SELECT (JUMPER = SINGLE SYS, NO JUMPER = TWO SYS)
J9-8	CR1 (SYS 1 MOTOR PROTECTOR / HIGH PRESS CUTOUT)
J9-9	CR2 (SYS 2 MOTOR PROTECTOR / HIGH PRESS CUTOUT)

TABLE 22 - MICROBOARD ANALOG INPUTS

J4-10	SYS 1 SUCTION PRESS TRANSDUCER OR SYS 1 LOW PRESS SWITCH
J4-11	SPARE
J4-12	SYS 1 DISCHARGE PRESSURE TRANSDUCER (OPTIONAL)
J5-12	SYS 1 SUCTION TEMP SENSOR - YCUL OPTION
J5-13	SYS 2 SUCTION TEMP SENSOR - YCUL OPTION
J5-14	SPARE
J5-15	SPARE
J6-7	AMBIENT AIR TEMPERATURE SENSOR
J6-8	LEAVING CHILLED LIQUID TEMPERATURE SENSOR
J6-9	RETURN CHILLED LIQUID TEMPERATURE SENSOR OR DISCHARGE AIR TEMP SENSOR - YCUL ONLY
J7-10	SYS 2 SUCT PRESS TRANSDUCER OR SYS 2 LOW PRESS SWITCH
J7-11	SPARE
J7-12	SYS 2 DISCHARGE PRESSURE TRANSDUCER (OPTIONAL)
J8-5	SYS 1 GROUND FAULT CIRCUIT
J8-6	SYS 2 GROUND FAULT CIRCUIT

TABLE 23 - MICROBOARD OUTPUTS

TB3-2	SYSTEM 1 COMPRESSOR 1
TB3-3	SYS 1 LIQUID LINE SOLENOID VALVE
TB3-4	SYSTEM 1 COMPRESSOR 2
TB3-5	SYSTEM 1 COMPRESSOR 3
TB3-6	SYSTEM 1 HOT GAS BYPASS VALVE
TB3-8	SYSTEM 2 COMPRESSOR 1
TB3-9	SYS 2 LIQUID LINE SOLENOID VALVE
TB3-10	SYSTEM 2 COMPRESSOR 2
TB4-1	SYSTEM 2 COMPRESSOR 3
TB4-2	SYS 1 CONDENSER FAN STAGE 1
TB4-4	SYS 1 CONDENSER FAN STAGE 2
TB4-5	SYS 1 CONDENSER FAN STAGE 3
TB4-6	SYS 2 CONDENSER FAN STAGE 1
TB4-8	SYS 2 CONDENSER FAN STAGE 2
TB4-9	SYS 2 CONDENSER FAN STAGE 3
TB4-10	EVAPORATOR HEATER
TB5-1	SYSTEM 1 ALARM
TB5-2	SYSTEM 2 ALARM
TB5-3	EVAPORATOR PUMP STARTTER

* The 30 dc unregulated supply is not an input. This voltage originates on the microboard and is used to supply the contacts for the binary inputs.

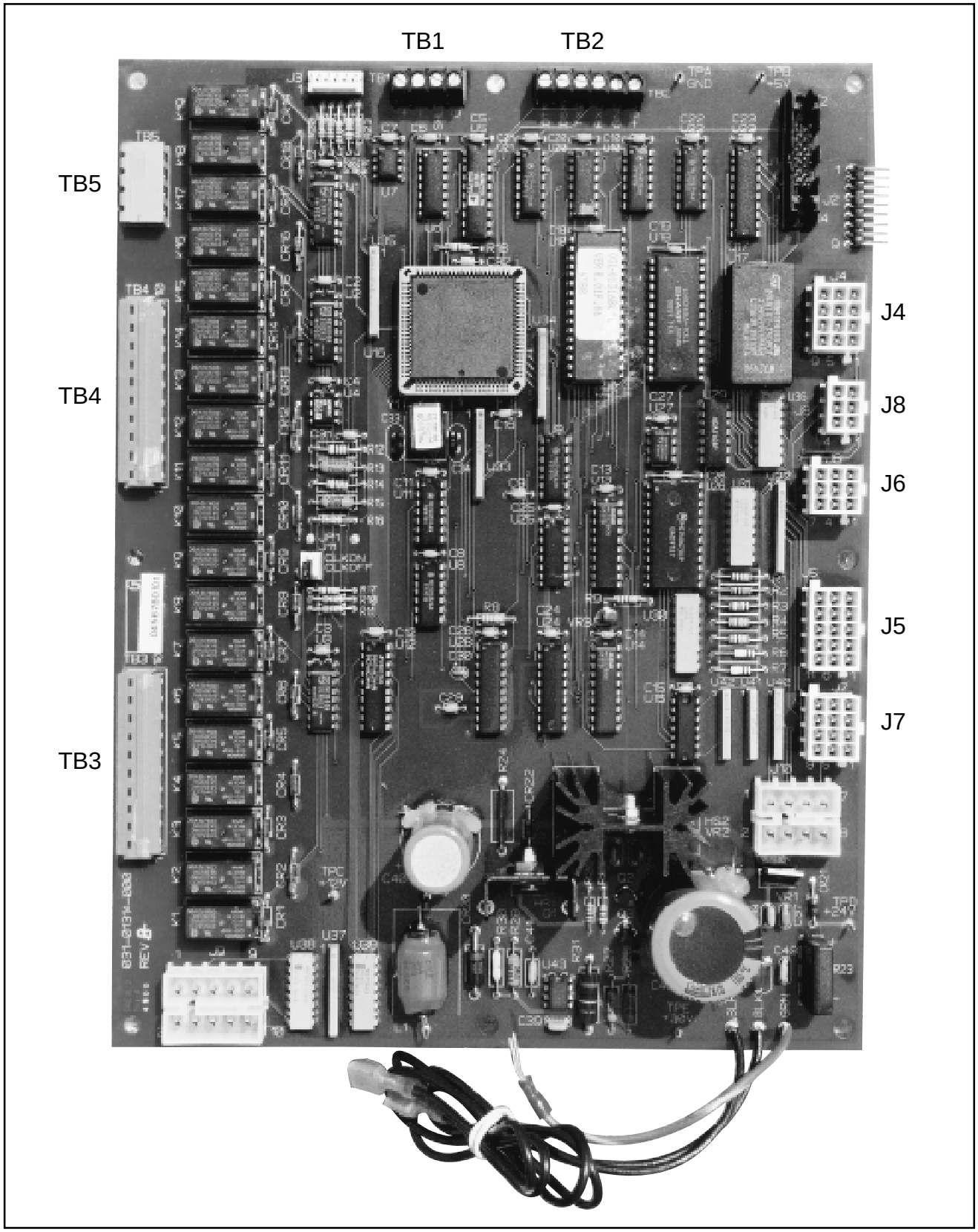


FIG. 4 - MICROBOARD LAYOUT

BINARY INPUTS

Refer to the unit wiring diagram. All binary inputs are connected to J9 of the microboard. The term “binary” refers to two states - either on or off. As an example, when the flow switch is closed, 30 volts ***dc*** will be applied to J9, pin 5 (J9-5) of the microboard. If the flow switch is open, 0 volts dc will then be present at J9-5.

Pin 1 of 9 is an *unregulated* 30 vdc that is the ***dc*** voltage ***source*** used to supply the dc voltage to the various contacts, unit switch, flow switch, etc. This dc source is factory wired to CTB 1, terminal 13. Any switch or contact used as a binary input would be connected to this terminal, with the other end connecting to it’s respective binary input on the microboard. Anytime a switch or contact is closed, 30 vdc would be applied to that particular binary input. Anytime a switch or contact is open, 0 vdc would be applied to that particular binary input.

Typically, as high as 34 vdc could be measured for the dc voltage on the binary inputs. This voltage is in reference to ground. The unit case should be sufficient as a reference point when measuring binary input voltages.

ANALOG INPUTS - TEMPERATURE

Refer to the unit wiring diagram. Temperature inputs are connected to the microboard on plug J6. These ***analog*** inputs represent varying dc signals corresponding to varying temperatures. All voltages are in reference to the unit case (ground). Following are the connections for the temperature sensing inputs:

Outside Air Sensor
J6-4 = +5 VDC regulated supply to sensor.
J6-7 = VDC input signal to the microboard. See Table 24 for voltage readings that correspond to specific outdoor temperatures.
J6-1 = drain (sheild connection = 0 VDC)

TABLE 24 - OUTDOOR AIR SENSOR TEMPERATURE/VOLTAGE/ RESISTANCE CORRELATION

Temp°F	Voltage	Resistance	Temp°C
0	0.7	85398	-18
5	0.8	72950	-15
10	0.9	62495	-12
15	1.0	53685	-9
20	1.1	46240	-7
25	1.2	39929	-4
30	1.4	34565	-1
35	1.5	29998	2
40	1.7	26099	4
45	1.8	22673	7
50	2.0	19900	10
55	2.2	17453	13
60	2.3	15309	16
65	2.5	13472	18
70	2.6	11881	21
75	2.8	10501	24
80	2.9	9298	27
85	3.1	8250	29
90	3.2	7332	32
95	3.4	6530	35
100	3.5	5827	38
105	3.6	5209	41
110	3.7	4665	43
115	3.8	4184	46
120	3.9	3759	49
125	4.0	3382	52
130	4.1	3048	54

TABLE 25 - ENTERING AND LEAVING CHILLED LIQUID TEMP. SENSOR TEMPERATURE/VOLTAGE/ RESISTANCE CORRELATION

Temp°F	Voltage	Resistance	Temp°C
0	1.71	25619	-18
2	1.78	24046	-17
4	1.85	22580	-16
6	1.93	21214	-14
8	2.00	19939	-13
10	2.07	18749	-12
12	2.15	17637	-11
14	2.22	16599	-10
16	2.30	15629	-9
18	2.37	14721	-8
20	2.45	13872	-7
22	2.52	13077	-6
24	2.59	12333	-4
26	2.67	11636	-3
28	2.74	10982	-2
30	2.81	10370	-1
32	2.88	9795	0
34	2.95	9256	1
36	3.02	8750	2
38	3.08	8276	3
40	3.15	7830	4
42	3.21	7411	6
44	3.27	7017	7
46	3.33	6647	8
48	3.39	6298	9
50	3.45	5970	10
52	3.51	5661	11
54	3.56	5370	12
56	3.61	5096	13
58	3.67	4837	14
60	3.72	4593	16
62	3.76	4363	17
64	3.81	4145	18
66	3.86	3941	19
68	3.90	3747	20
70	3.94	3564	21
72	3.98	3392	22
74	4.02	3228	23
76	4.06	3074	24
78	4.10	2928	26
80	4.13	2790	27

Entering Chilled Liquid Sensor

J6-6 = +5 VDC regulated supply to sensor.
J6-9 = VDC input signal to the microboard. See Table 25 for voltage readings that correspond to specific liquid temperatures.
J6-3 = drain (shield connection = 0 VDC)

Leaving Chilled Liquid Temp. Sensor

J6-5 = +5VDC regulated supply to sensor.
J6-8 = VDC input signal to the microboard. See Table 25 for voltage readings that correspond to specific liquid temperatures.
J6-2 = drain (sheild connection = 0 VDC)

ANALOG INPUTS - PRESSURE

Refer to the unit wiring diagram. Pressure inputs are conected to the microboard on plugs J4 and J7. These ***analog*** inputs represent varying dc signals corresponding to varying pressure. All voltages are in reference to the unit care (ground).

System 1 discharge and suction pressures will be connected to J4 of the microboard. System 2 discharge and suction pressure transducers will be connected to J7 of the microboard.

The discharge transducers are optional on all units. If the discharge transducers are not installed, no connections are made to the microboard and the discharge pressure readout on the display would be zero.

If the suction transducers are not installed, a mechanical low pressure switch will be installed in its place, and the suction pressure readout on the display will be 0 psig when the LP switch is open, and 200 PSIG (13.79 BARG) when the LP switch is closed.

The discharge transducers have a range from 0 to 400 psig. The output will be linear from .5 VDC to 4.5 VDC over the 400 PSIG (27.5 BARG) range. Following is the formula that can be used to verify the voltage output of the transducer. All voltage reading are in reference to ground (unit case).

V = (Pressure in PSIG x .01) + .5

or

V = (Pressure in BARG x .145) + .5

where V = dc voltage output

Pressure = pressure sensed by transducer

The microboard connections for the Discharge Transducers:

System 1 Discharge Transducer

J4-7 = +5 VDC regulated supply to transducer.
J4-12 = VDC input signal to the microboard. See the formula above for voltage readings that correspond to specific discharge pressures.
J4-8 = +5 VDC return
J4-9 = drain (shield connection = 0 VDC)

System 2 Discharge Transducer

J7-7 = +5 VDC regulated supply to transducer.
J7-12 = VDC input signal to the microboard. See the formula above for voltage readings that correspond to specific discharge pressures.
J7-8 = +5 VDC return
J7-9 = drain (shield connection = 0 VDC)

The suction transducers have a range from 0 to 200 psig (13.79 BARG). The output will be linear from .5 vdc to 4.5 vdc over the 200 psig (13.79 BARG) range. Following is a formula that can be used to verify the voltage output of the transducer. All voltage reading are in reference to ground (unit case).

V = (Pressure in PSIG x .02) + .5

or

V = (Pressure in BARG x .29) + .5

where V = dc voltage input to micro

Pressure = pressure sensed by transducer

Following are the microboard connections for the Suction Transducer:

System 1 Suction Transducer

J4-5 = +5 regulated supply to transducer.
J4-10 = VDC input signal to the microboard. See the formula above for voltage readings that correspond to specific suction pressures.
J4-1 = +5 VDC return
J4-2 = drain (shield connection = 0 VDC)

System 2 suction Transducer

J7-5 = +5 VDC regulated supply to transducer.
J7-10 = VDC input signal to the microboard. See the formula above for voltage readings that correspond to specific suction pressures.
J7-1 = +5 VDC return
J7-2 = drain (shield connection = 0 VDC)

Following are the microboard connections for the Low Pressure Switch.

System 1 Low Pressure Switch

J4-5 = +5 VDC regulated supply to LP switch.
J4-10 = input signal to the microboard. 0 VDC = open switch / +5 VDC = closed switch.
J4-2 = drain (shield connection = 0 VDC)

System 2 Low Pressure Switch

J7-5 = +5 VDC regulated supply to LP switch.
J7-10 = input signal to the microboard. 0 VDC = open switch / +5 VDC = closed switch.
J7-2 = drain (shield connection = 0 VDC)

DIGITAL OUTPUTS

Refer to the unit wiring diagram and Table 23. The digital outputs are located on TB3, TB4, and TB5 of the microborad. **ALL OUTPUTS ARE 115 VAC** with the exception of TB5-3 to TB5-4, TB5-3 to TB5-4 are the contacts that can be used for an evaporator pump start signal. The voltage applied to either of these terminals would be determined by field wiring.

Each output is controlled by the microprocessor by switching 115 VAC to the respective output connection energizing contractors, evap. heater, and solenoids accroding to the operating sequence.

115 vac is supplied to the microboard via connections at TB3-1, TB3-7, TB4-3, and TB4-7. Figure 5 illustrates the relay contact architecture on the microboard.

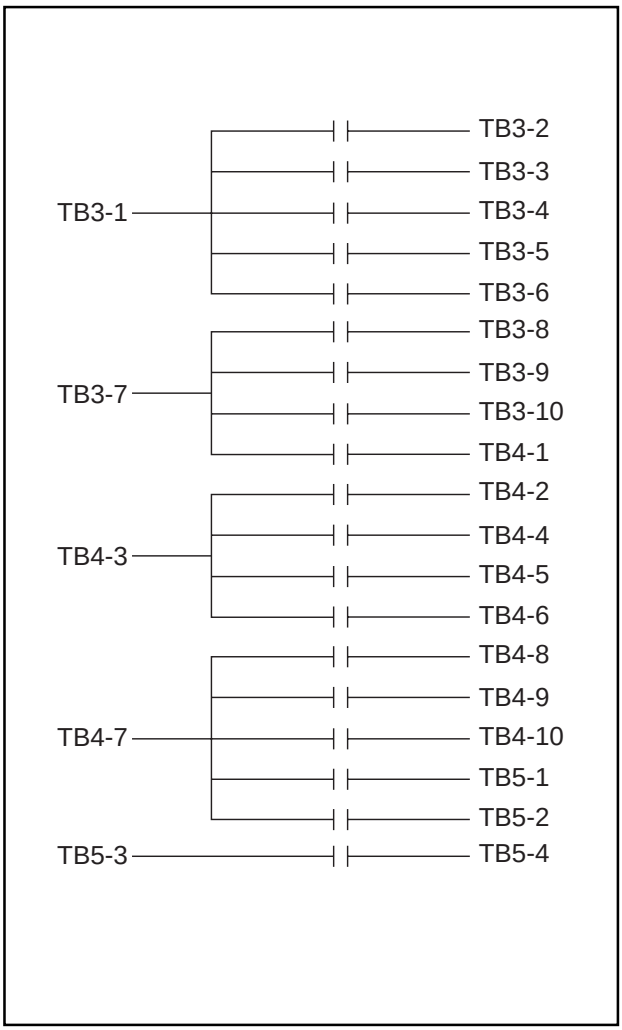


FIG. 5 - MICROBOARD RELAY CONTACT ARCHITECTURE

KEYPAD

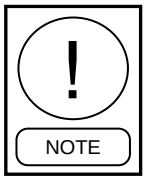
The operator keypad is connected to the microboard by a ribbon cable, which is connected to J2 on the microboard.

The integrity of a specific “button” on the keypad can be verified by doing a continuity check across two specific points (or pins), that represent one of twelve “buttons” on the keypad.

Table 26 lists the key / pin assigments for the keypad. Power to the microboard must be turned off, and the ribbon cable disconnected from the microboard prior to conducting tests, or component damage may result.

Table 26 lists the key / pin assignments for the keypad. **Power to the microboard must be turned off, and the ribbon cable disconnected from the microboard prior to conducting the tests, or component damage may result.**

After the ribbon cable is disconnected from microboard, ohmmeter leads are connected to the pins representing the specific “button” to be tested. After connecting the meter leads, the “button” being checked is pressed and a reading of zero ohms should be observed. After releasing the “button”, the resistance value should be infinite (open circuit).



Pin 1 is usually identified by a stripe on the ribbon cable.

TABLE 26 - KEYPAD PIN ASSIGNMENT MATRIX

KEYPAD	PIN CONNECTIONS
STATUS	1 TO 5
OPER DATA	1 TO 7
PRINT	1 TO 6
HISTORY	1 TO 8
UP ARROW	2 TO 5
DOWN ARROW	2 TO 7
ENTER / ADV	2 TO 6
COOLING SETPOINTS	2 TO 8
SCHEDULE / ADVANCE DAY	3 TO 5
PROGRAM	3 TO 7
OPTIONS	3 TO 6
CLOCK	3 TO 8

OPTIONAL PRINTER INSTALLATION

The micro panel is capable of supplying a printout of chiller conditions or fault shutdown information at any given time. This allows operator and service personnel to obtain data and system status with the touch of the keypad. In addition to manual print selection, the micro panel will provide an automatic printout whenever a fault occurs. Detailed explanation of the print function is given under "Print Key" located in the Keypad and Display section.

YORK recommends the field tested WEIGH-TRONIX model 1220 printer (of former IMP 24). This is a compact low cost printer that is ideal for service work and data logging.

The WEIGH-TRONIX printer can be obtained by contacting WEIGH-TRONIX for purchase information at:

WEIGH-TRONIX
2320 Airport Blvd.
Santa Rosa, CA 95402
Phone: 1-800-982-6622 or 1-707-527-555
(International Orders Only)

The part number for the printer that is packaged specifically for YORK is P/N 950915576. The cable to connect the printer can either be locally assembled from the parts listed, or ordered directly from WEIGH-TRONIX under part number 287-040018.

Parts

The following parts are required:

1. WEIGH-TRONIX model 1220 printer.
2. 2.25" (5.7cm) wide desk top calculator paper.
3. 25ft. (7.62m) maximum length of Twisted Pair Shield Cable (minimum 3 conductor), #18 AWG stranded, 300V minimum insulation.
4. One 25 pin Cannon connector and shell.
   Connector: Cannon P/N DB-25P or equivalent.
   Shell: Cannon P/N DB-C2-J9.

Assembly and Wiring

All components should be assembled and wired as shown in Figure 6. Strip the outside insulation back several inches and individual wires about 3/8" (9.5 mm) to connect the cable at the Microboard. Do not connect the shield at the printer-end of the cable.

Obtaining a Printout

A printout is obtained by pressing the "PRINT" key on the keypad and then pressing either "OPER DATA" key or "HISTORY" key.

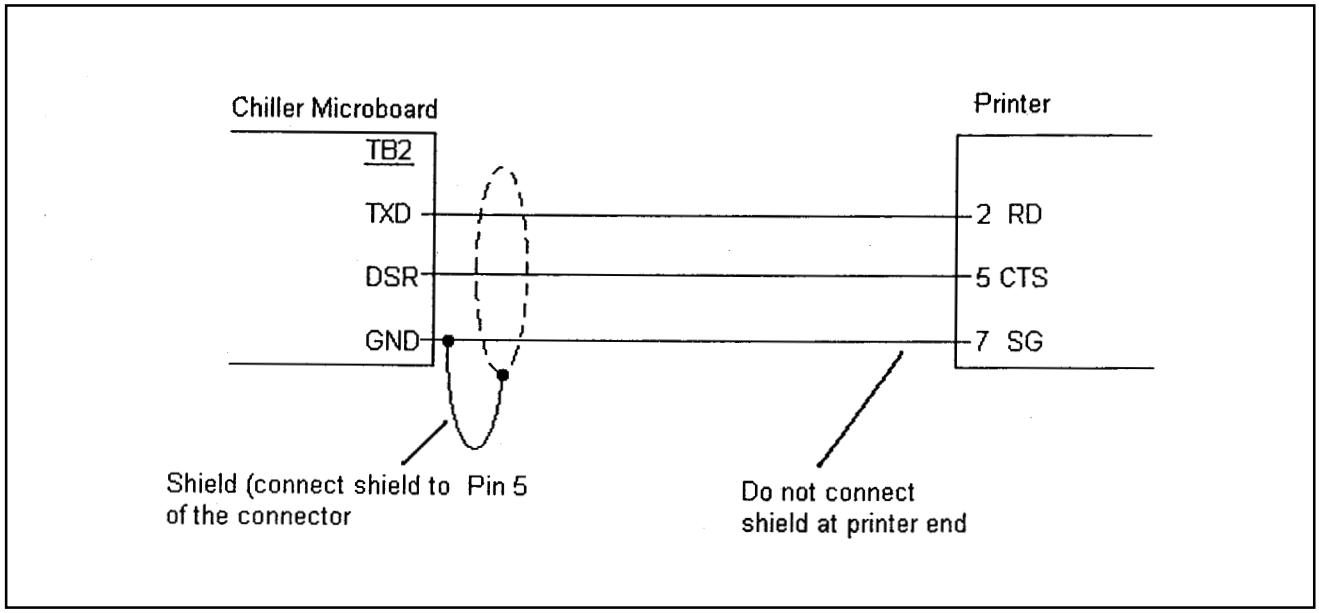


FIG. 6 - PRINTER TO MICROBOARD ELECTRICAL CONNECTIONS

TABLE 27 - TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
NO DISPLAY ON PANEL. UNIT WILL NOT OPERATE.	1. No 115VAC to 1T.	1 a. Check wiring and fuse 3FU. b. Check wiring emergency stop contacts 5 to L of CTB2 Terminal Block. c. Replace 1T.
	2. No 24VAC to Microboard.	2. Check wiring 1T to Microboard.
	3. 1T defective, no 24VAC output.	3. Replace 1T.
	4. Short in wire to temp. sensors or pressure transducers.	4. Unplug connections at Microboard to isolate.
	5. Defective Microboard or Display board.	5. Replace Microboard. *NOTE: Contact YORK service before Replacing circuit Boards!*
"FLOW SWITCH / REM STOP NO RUN PREMISSIVE"	1. No chilled liquid flow.	1. Check chilled liquid flow.
	2. Flow switch improperly installed.	2. Check that the flow switch is installed according to manufacturer's instructions.
	3. Defective flow switch.	3. Replace flow switch.
	4. Remote cycling device open.	4. Check cycling devices connected to terminals 13 & 14 of the CTB1 Terminal Block.
"LOW SUCTION PRESSURE" FAULT	1. Improper suction pressure cut-outs adjustments.	1. Adjust per recommended settings.
	2. Low refrigerant charge.	2. Repair leak if necessary and add refrigerant.
	3. Fouled filter dryer.	3. Change dryer/core.

CONT'D

PROBLEM	CAUSE	SOLUTION
"LOW SUCTION PRESSURE" FAULT (CONT'D)	4. TXV defective.	4. Replace TXV.
	5. Reduced flow of chilled liquid through the cooler.	5. Check GPM (See "Limitations" in Installation section). Check operation of pump, clean pump strainer, purge chilled liquid system of air.
	6. Defective suction pressure transducer/low pressure switch or wiring.	6. Replace transducer/low pressure switch or faulty wiring. Refer to "Service" section for pressure/voltage formula.
	7. LLSV defective.	7. Repalced LLSV.
"HIGH DISCHARGE PRESSURE" FAULT	1. Condenser fans not operating or operating backwards.	1. Check fan motor, fuses, and contactors. Assure fan blows air upward.
	2. Too much refrigerant.	2. Remote refrigerant.
	3. Air in refrigerant system.	3. Evacuate and recharge system.
	4. Defective discharge Pressure transducer.	4. Replace discharge pressure transducer. Refer to Service section for pressure/voltage formula.
"LOW LIQUID TEMP" FAULT	1. Improperly adjusted leaving chilled liquid temp cut-out (glycol only).	1. Re-program the leaving chilled liquid temp. cut-out.
	2. Microboard setpoint/range values improperly programmed.	2. Re-adjust setpoint/range.
	3. Chilled liquid flow too low.	3. Increase chilled liquid flow-refer to Limitations in Installation section.
	4. Defective LWT or RWT sensor. (assure the sensor is properly installed in the bottom of the well with a generous amount of heat conductive compound).	4. Compare sensor against a known good temperature sensing device. Refer to Service section for temp./ voltage table.

CONT'D

PROBLEM	CAUSE	SOLUTION
"MP/HPCO" FAULT	1. Compressor internal motor protector (MP) open.	1. Verify refrigerant charge is not low. Verify superheat setting of 10° - 15°F (5.6° - 8.3°C). Verify correct compressor rotation. Verify compressor is not over loaded.
	2. Extrenal overload tripped.	2. Determine cause and reset.
	3. HPCO switch open.	3. See "High Press. Disch." Fault.
	4. Defective HPCO switch.	4. Replace HPCO switch.
	5. Defective CR relay.	5. Replace relay.
COMPRESSOR(S) WON'T START	1. Demand not geat enough.	1. No problem. Consult "Installation" Manual to aid in understanding compressor operation and capacity control.
	2. Defective water temperature sensor.	2. Compare the display with a thermometer. Should be within +/- 2 degrees. Refer to Service section for RWT/ LWT temp./voltage table.
	3. Contactor/Overload failure.	3. Replace defective part.
	4. Compressor failure.	4. Diagnose cause of failure and replace.
LACK OF COOLING EFFECT	1. Fouled evaporator surface. Low suction pressure will be observed.	1. Contact the local YORK service representative.
	2. Improper flow through the evaporator.	2. Reduce flow to within chiller design specs. See limitations in Installation section.
	3. Low refrigerent charge. Low suction pressure will be observed.	3. Check subcooling and add charge as needed.

MAINTENANCE

It is the responsibility of the equipment owner to provide maintenance on the system.

IMPORTANT

If system failure occurs due to improper maintenance during the warranty period, YORK will not be liable for costs incurred to return the system to satisfactory operation. The following is intended only as a guide and covers only the chiller unit components. It does not cover other related system components which may or may not be furnished by YORK. System components should be maintained according to the individual manufacture's recommendations as their operation will affect the operation of the chiller.

COMPRESSORS

Oil Level check:

The oil level can only be tested when the compressor is running in stabilized conditions, to ensure that there is no liquid refrigerant in the lower shell of the compressor. When the compressor is running at stabilized conditions, the oil level must be between 1/2 and 3/4 in the oil sight glass. Note: at shutdown, the oil level can fall to the bottom limit of the oil sight glass. Use YORK "F" oil when adding oil.

Oil Analysis:

The oil used in these compressors is pale yellow in color (mineral oil). If the oil color darkens or exhibits a change in color, this may be an indication of contaminants in the refrigerant system. If this occurs, an oil sample should be taken and analyzed. If contaminants are present, the system must be cleaned to prevent compressor failure.

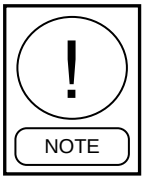
Never use the scroll compressor to pump the refrigerant system down into a vacuum. Doing so will cause internal arcing of the compressor motor which will result in failure of compressor.

CONDENSER FAN MOTORS

Condenser fan motor are permanently lubricated and required no maintenance.

CONDENSER COILS

Dirt should not be allowed to accumulate on the condenser coil surfaces. Cleaning should be as often as necessary to keep coil clean.



Exercise care when cleaning the coil so that the coil fins are not damaged.

OPERATING PARAMETERS

Regular checks of the system should be performed to ensure that operating temperatures and pressures are within limitations, and that the operating controls are set within proper limits. Refer to the Operation, Start-Up, and Installation section of this manual.

ON-BAORD BATTERY BACK-UP

U17 is the Real Time Clock chip that maintains the date/time and stores customer programmed setpoints. Anytime the chiller is to be off (no power to the microboard) for an extended time (week/months), the clock should be turned off to conserve power of the on-board battery. To accomplish this, the J11 jumper on the microboard must be moved to the "CLKOFF" position while power is still supplied to the microboard.

THE UNIT EVAPORATOR HEATER IS 120 VAC. DISCONNECTING 120 VAC POWER FROM THE UNIT, AT OR BELOW FREEZING TEMPERATURE, CAN RESULT IN DAMAGE TO THE EVAPORATOR AND UNIT AS A RESULT OF THE CHILLED LIQUID FREEZING.

OVERALL UNIT INSPECTION

In addition to the checks listed on this page, periodic overall inspections of the unit should be accomplished to ensure proper equipment operation. Items such as loose hardware, component operation, refrigerant leaks, unusual noises, etc. should be investigated and corrected immediately.

RECEIVED DATA (CONTROL DATA)

The middle Market received 8 data values from the ISN. The first 4 are analog values and the last 4 are digital values. These 8 data values are used as control parameter when in REMOTE mode. When the unit is in LOCAL mode, these 8 values are ignored. If the unit receives no valid ISN transmission for 5 minutes it will revert back to all local control values. Table 28 lists the control parameters. These values are found under feature 31 on the ISN.

TABLE 28 - ISN RECEIVED DATA

ISN PAGE	CONTROL DATA
P03	SETPOINT
P04	LOAD LIMIT STAGE (0,1,2)
P05	COOLING RANGE (DAT MODE ONLY)
P06	-
P07	START/STOP COMMAND
P08	-
P09	-
P10	HISTORY BUFFER REQUEST

TRANSMITTED DATA

After receiving a valid transmission from the ISN, the unit will transmit either operational data or history buffer data depending on the “History Buffer Request”. Data must be transmitted for every ISN page under features 31. If there is no value to be sent to a particular page, a zero will be sent. Tables 29 - 30 show the data values and page listings for this unit.

TABLES 29 - ISN TRANSMITTED DATA

ISN PAGE	TYPE	DATA
P11	ANALOG	LEAVING CHILLED LIQUID TEMP.
P12	ANALOG	RETURN CHILLED LIQUID TEMP.
P13	ANALOG	MIXED CHILLED LIQUID TEMP.
P14	ANALOG	DISCHARGE AIR TEMP.
P15	ANALOG	-
P16	ANALOG	AMBIENT AIR TEMP.
P17	ANALOG	-
P18	ANALOG	SYS 1 RUN TIME (SECONDS)
P20	ANALOG	SYS 1 DISCHARGE PRESSURE
P21	ANALOG	-
P22	ANALOG	-
P23	ANALOG	-
P24	ANALOG	SYS 1 ANTI-RECYCLE TIMER
P25	ANALOG	ANTI-COINCIDENT TIMER
P27	ANALOG	SYS 2 RUN TIME (SECONDS)
P28	ANALOG	SYS 2 SUCTION PRESSURE
P29	ANALOG	SYS 2 DISCHARGE PRESSURE
P33	ANALOG	SYS 2 ANTI-RECYCLE TIMER
P35	ANALOG	NUMBER OF COMPRESSORS
P36	DIGITAL	SYS 1 ALARM
P37	DIGITAL	SYS 2 ALARM
P38	DIGITAL	EVAPORATOR HEATER STATUS
P39	DIGITAL	EVAPORATOR PUMP STATUS
P40	DIGITAL	-
P41	DIGITAL	-

TABLES 30 - ISN TRANSMITTED DATA

ISN PAGE	TYPE	DATA
P42	DIGITAL	SYS 1 LIQUID LINE SOLENOID VALVE
P43	DIGITAL	SYS HOT GAS BYPASS VALVE
P44	DIGITAL	-
P45	DIGITAL	-
P46	DIGITAL	SYS 2 LIQUID LINE SOLENOID VALVE
P47	DIGITAL	LEAD SYSTEM (0=SYS 1) (1=SYS 2)
P48	DIGITAL	-
P49	DIGITAL	-
P50	DIGITAL	CHILLED LIQUID TYPE (0=WATER, 1=GLYCOL)
P51	DIGITAL	AMBIENT CONTROL MODE (0=STD, 1 = AMB)
P52	DIGITAL	LOCAL / REMOTE CONTROL MODE (0=LOCAL, 1=REMOTE)
P53	DIGITAL	UNITS (0=IMPERIAL, 1 = SI)
P54	DIGITAL	LEAD/LAG CONTROL MODE (0=MANUAL, 1=AUTO)
P55	DIGITAL	-
P56	CODED	*SYS 1 OPERATIONAL CODE
P57	CODED	*SYS 1 FAULT CODE
P58	CODED	*SYS 2 OPERATIONAL CODE
P59	CODED	*SYS 2 FAULT CODE
P60	CODED	SYS 1 COMP RUNNING

ISN PAGE	TYPE	DATA
P61	CODED	SYS 1 COND FANS RUNNING
P62	CODED	SYS 2 COMP RUNNING
P63	CODED	SYS 2 COND FANS RUNNING
P64	CODED	-
P65	ANALOG	UNIT CONTROL MODE 0=LEAVING WATER, 1=RETURN WATER 2=DISCHARGE AIR, 3=SUCTION PRESSURE
P66	ANALOG	ANTI-RECYCLE TIME (PROGRAMMED)
P67	ANALOG	LEAVING CHILLED LIQUID TEMP CUTOUT
P68	ANALOG	LOW AMBIENT TEMP CUTOUT
P69	ANALOG	-
P70	ANALOG	LOW SUCTION PRESS CUTOUT
P71	ANALOG	HIGH DISCHARGE PRESS CUTOUT
P72	ANALOG	SETPOINT
P73	ANALOG	COOLING RANGE
P74	ANALOG	SETPOINT 2 (SP CONTROL)
P75 - P84	-	NO DATA ALL ZEROS

* The operational and fault codes sent to pages 19 through 22 are defined in Table 31. Note that this table of fault and op codes is for all DX products. The codes that are greyed out are not used on this unit.

TABLE 31 - ISN OPERATIONAL AND FAULT CODES

P56/58	OPERATIONAL CODE	P57/59	FAULT CODE
0	NO ABNORMAL CONDITION	**0**	NO FAULT
1	UNIT SWITCH OFF	**1**	VAC UNDERVOLTAGE
2	SYSTEM SWITCH OFF	**2**	LOW AMBIENT TEMPERATURE
3	LOCK-OUT	**3**	HIGH AMBIENT TEMPERATURE
4	UNIT FAULT	**4**	LOW LEAVING CHILLED LIQUID TEMP
5	SYSTEM FAULT	**5**	HIGH DISCHARGE PRESSURE
6	REMOTE SHUTDOWN	**6**	HIGH DIFFERENTIAL OIL PRESSURE
7	DAILY SCHEDULE SHUTDOWN	**7**	LOW SUCTION PRESSURE
8	NO RUN PERMISSIVE	**8**	HIGH MOTOR CURRENT
9	NO COOL LOAD	**9**	LLSV NOT ON
10	ANTI-COINCIDENCE TIMER ACTIVE	**10**	LOW BATTERY WARNING
11	ANTI-RECYCLE TIMER ACTIVE	**11**	HIGH OIL TEMPERATURE
12	MANUAL OVERRIDE	**12**	HIGH DISCHARGE TEMPERATE
13	SUCTION LIMITING	**13**	IMPROPER PHASE ROTATION
14	DISCHARGE LIMITING	**14**	LOW MOTOR CURRENT / MP / HPCO
15	CURRENT LIMITING	**15**	MOTOR CURRENT UNBALANCED
16	LOAD LIMITING	**16**	LOW DIFFERENCIAL OIL PRESSURE
17	COMPRESSOR(S) RUNNING	**17**	GROUND FAULT
18		**18**	MP/ HPCO
19		**19**	LOW EVAPORATOR TEMPERATURE
20		**20**	INCORRECT REFRIGERANT PROGRAMMED
21		**21**	POWER FAILURE, MANUAL RESET REQUIRED
22		**22**	I/O BOARD FAILURE
23		**23**	OIL TEMP INHIBIT (LOW OIL TEMP)

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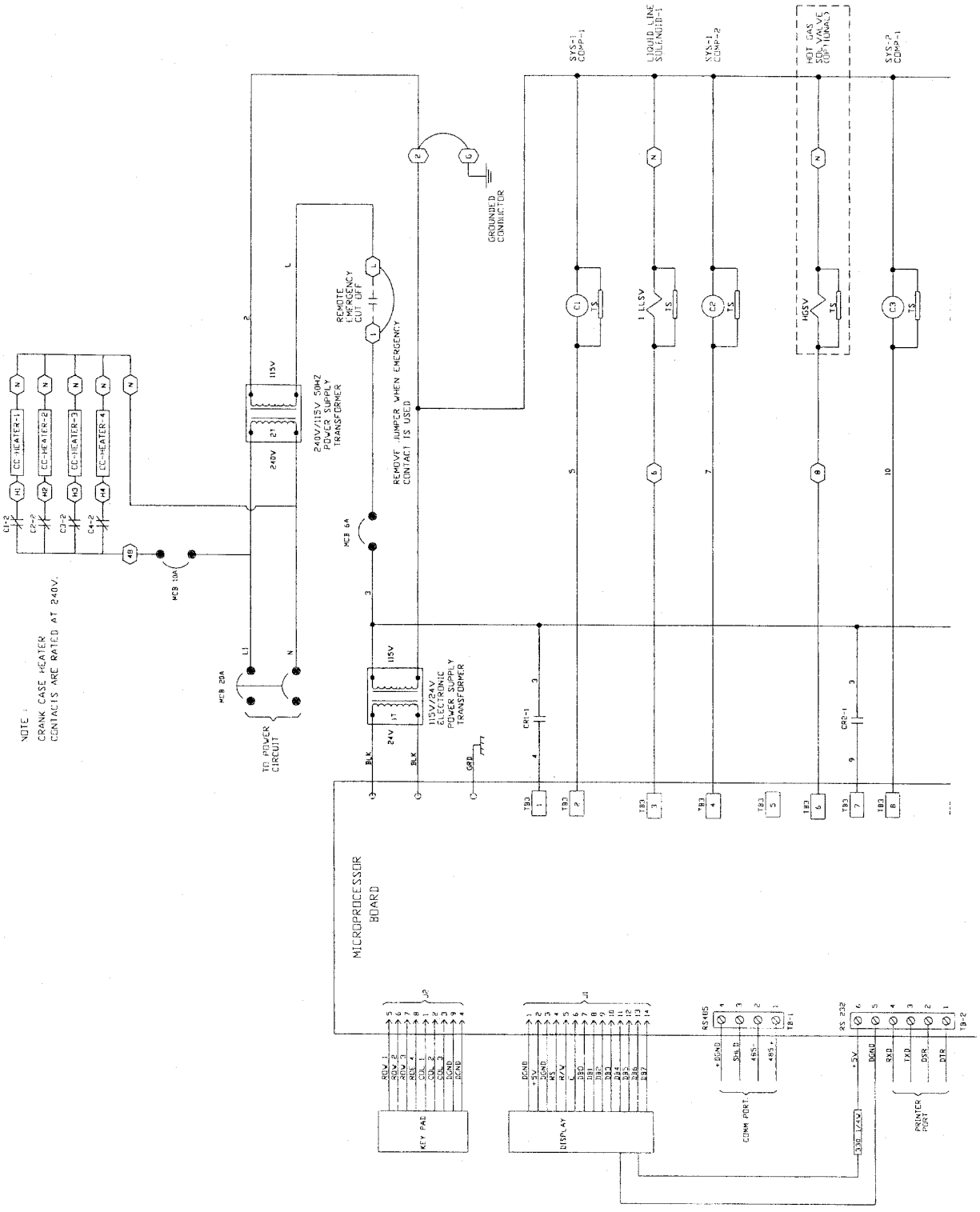
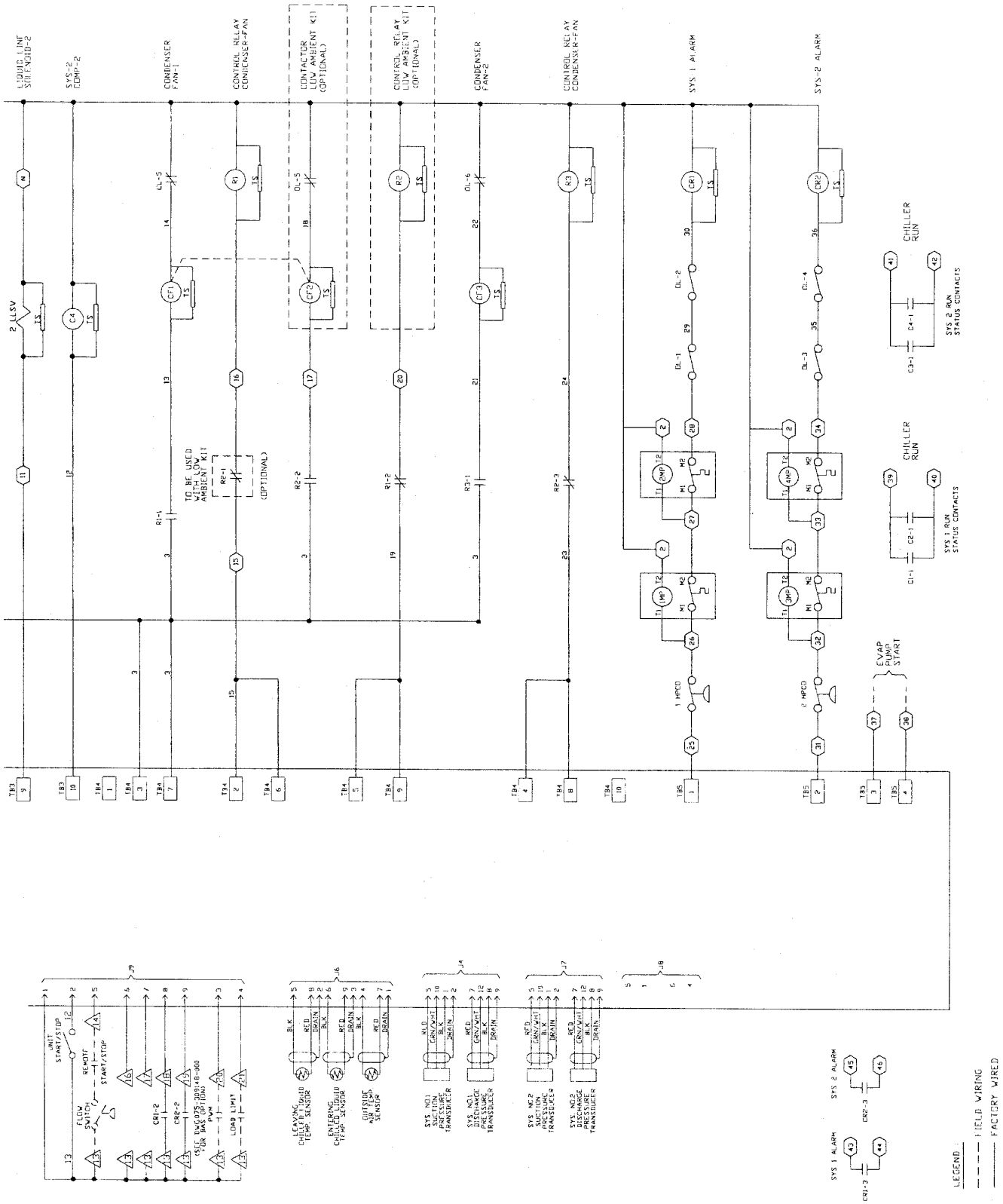
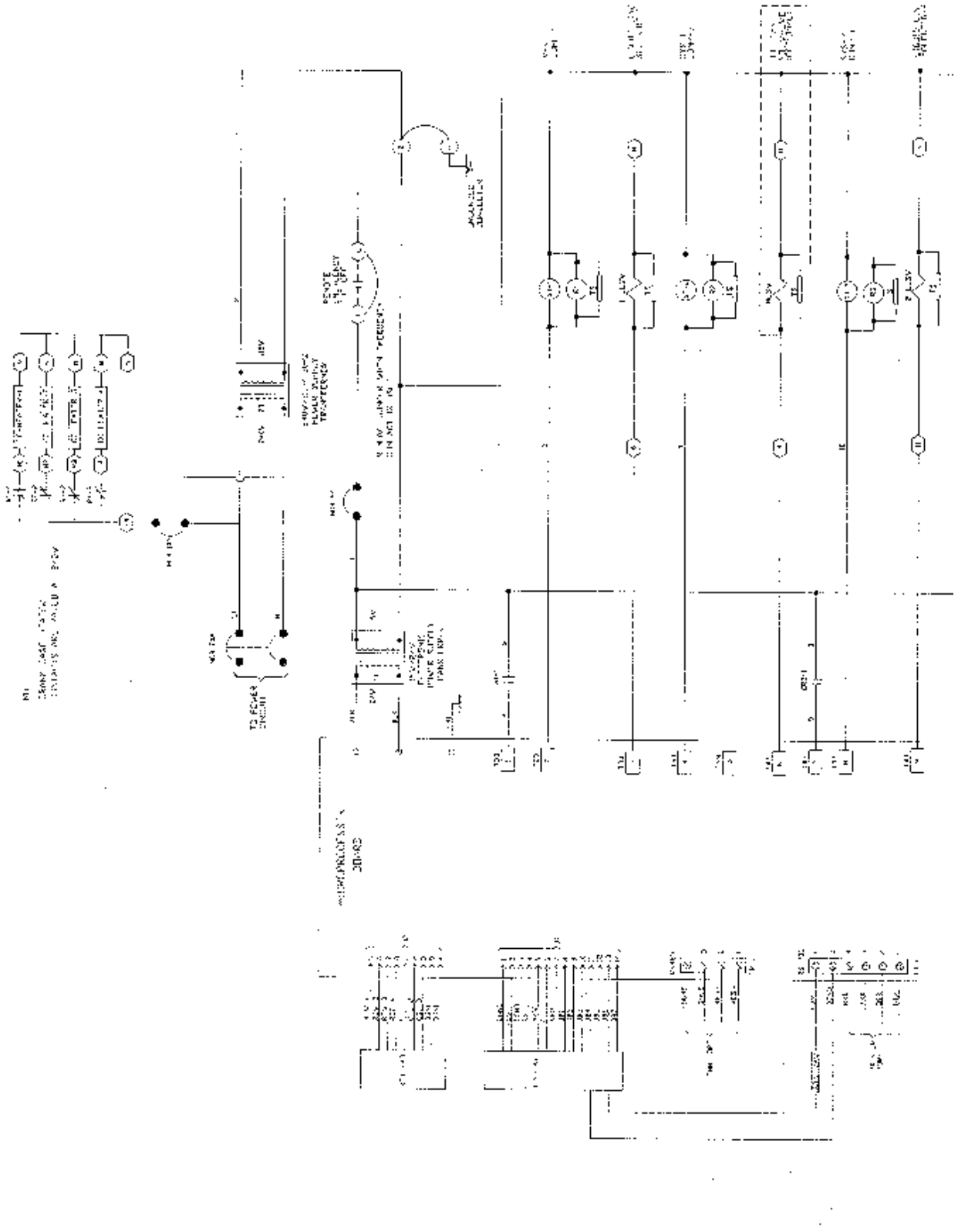
Circuit Wiring Diagram YCA 50 (DOL 50Hz)

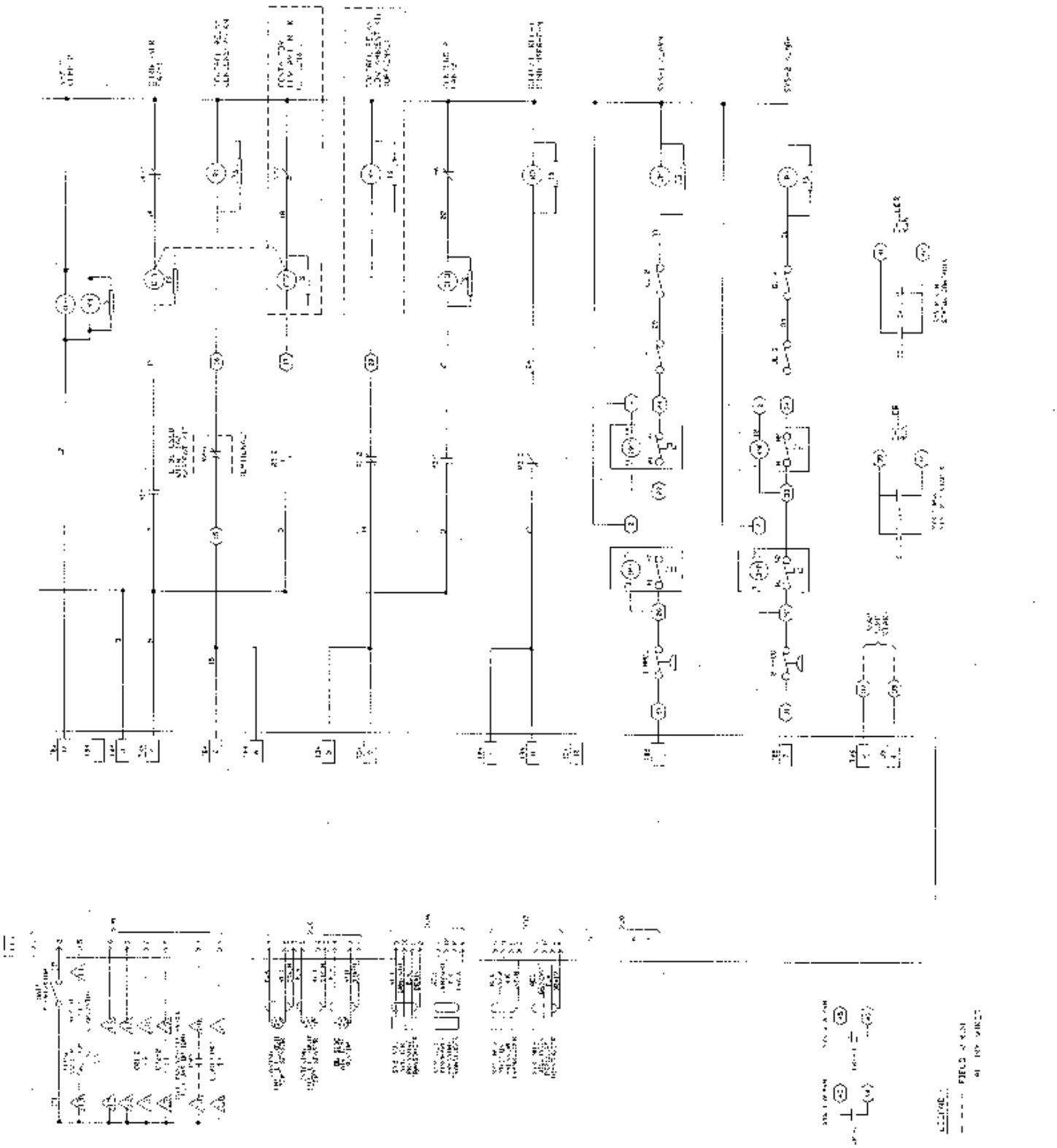


ELECTRICAL DATA

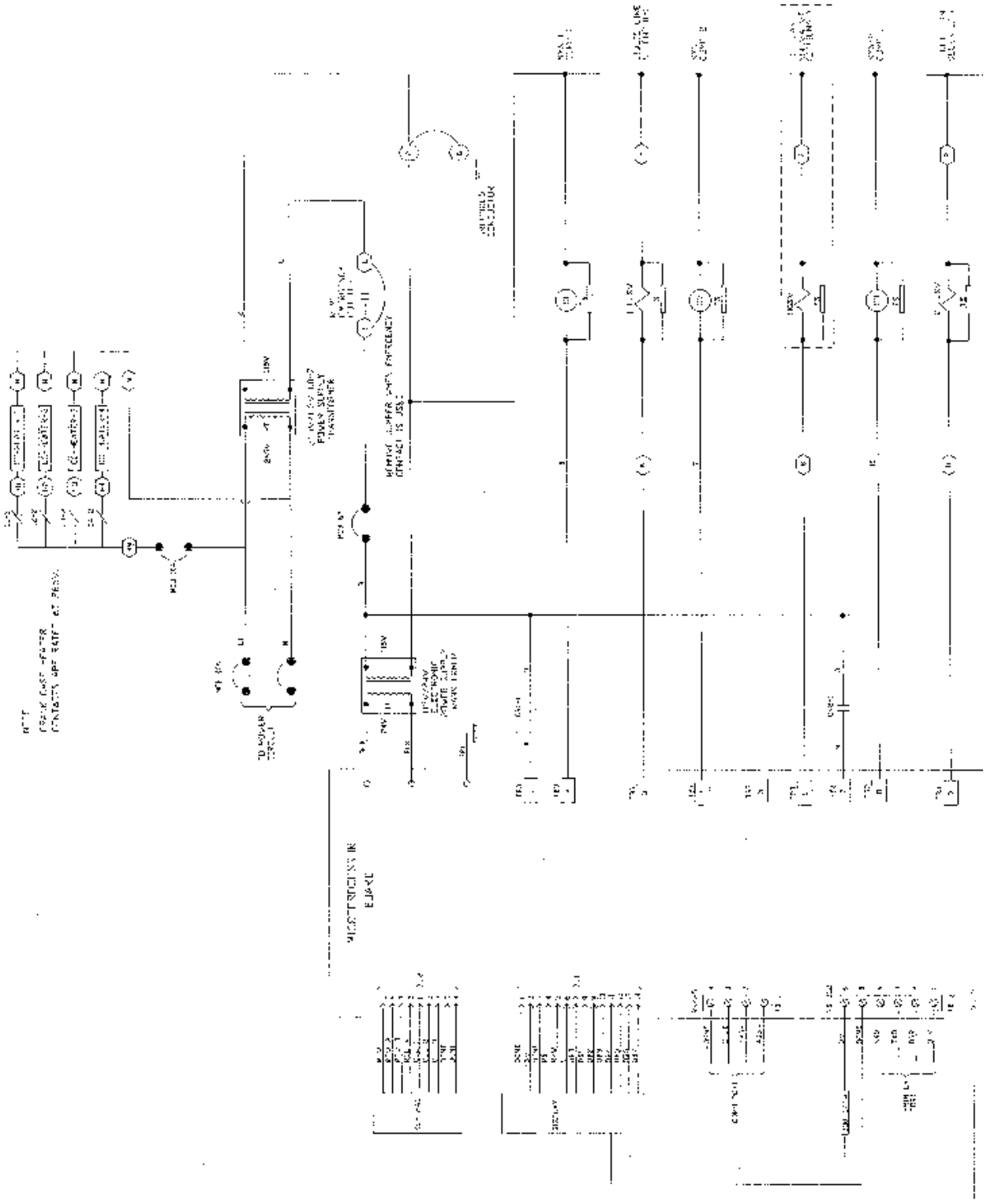


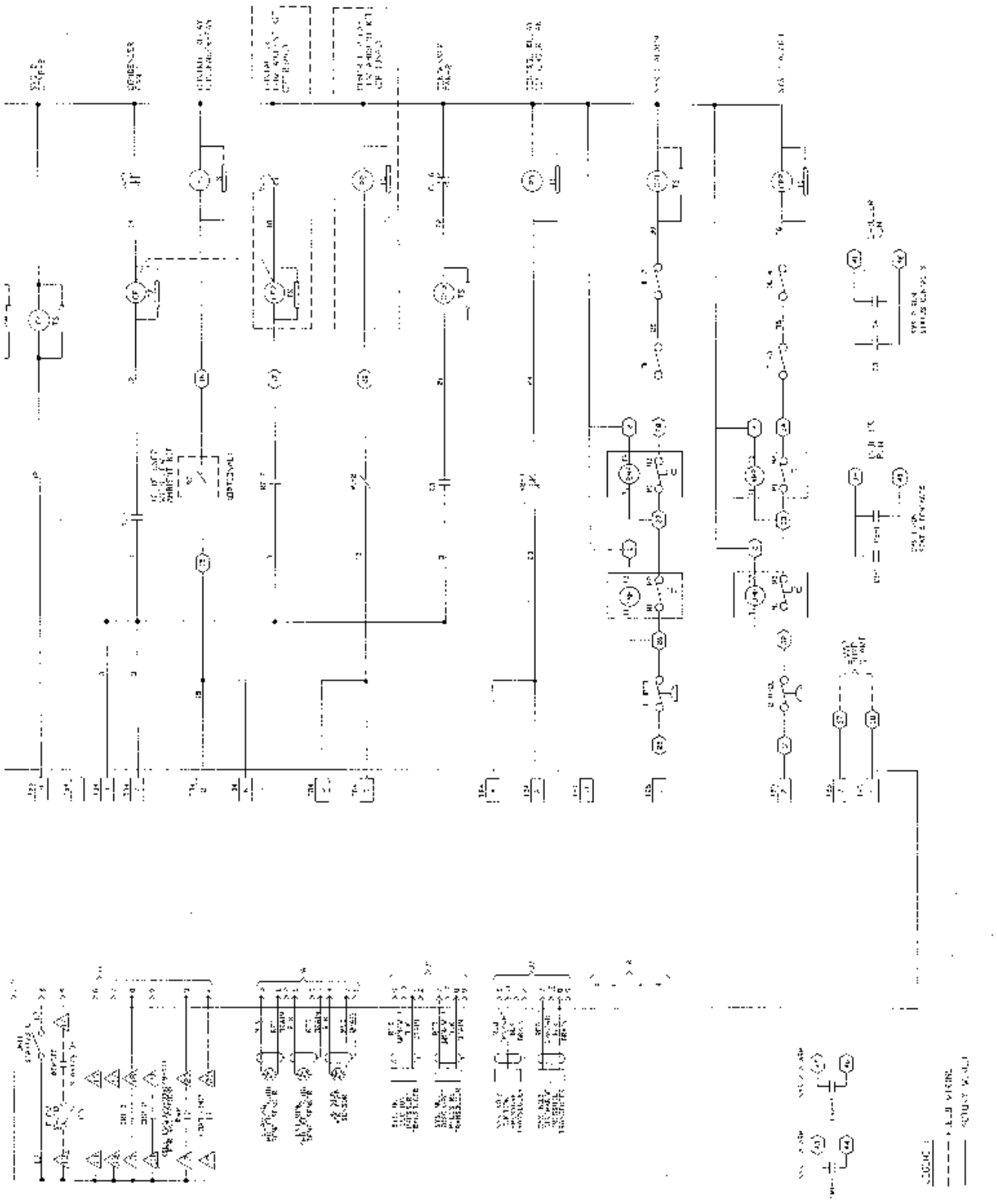
Circuit Wiring Diagram YCA 50 (SOFT STARTER 50Hz)





Circuit Wiring Diagram YCA 50 (DOL 60Hz)





Circuit Wiring Diagram YCA 50 (SOFT STARTER 60Hz)